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The correspondence between projected total fertility and contraceptive prevalence using the proximate determinants framework

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Stephen Kisambira

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PREFACE

The Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat is responsible for providing the international community with up-to-date and impartial information on population and development. The Population Division provides guidance on population and development issues to the United Nations General Assembly, the Economic and Social Council and the Commission on Population and Development and undertakes regular studies on population estimates and projections, fertility, mortality, migration, reproductive health, population policies and population and development interrelationships.

The purpose of the *Technical Paper* series is to publish substantive and methodological research on population issues carried out by experts within and outside the United Nations system. The series promotes scientific understanding of population issues among Governments, national and international organizations, research institutions and individuals engaged in social and economic planning, research and training.

This paper assesses the correspondence between two sets of independently-generated probabilistic projections: period total fertility from the 2012 Revision of *World Population Prospects* (WPP) and contraceptive prevalence from *Model-based Estimates and Projections of Family Planning Indicators 2014*. New variants of fertility and contraceptive prevalence for a 25-year projection period (2010-2035) are generated using the proximate determinants of fertility framework and using as time-varying inputs either total fertility estimates and projections from WPP or model-based contraceptive prevalence estimates and projections. The new variants are then compared with the median and 80 per cent prediction interval of the probabilistic projections of total fertility and contraceptive prevalence. The results from this paper can inform analyses of the impact on macro-level fertility and population size of accelerating access to and meeting demand for effective contraceptive methods, within the context of changes in the proximate determinants of fertility.

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The *Technical Paper* series as well as other population information may be accessed on the Population Division's website at www.unpopulation.org. For further information concerning this publication, please contact the office of the Director, Population Division, Department of Economic and Social Affairs, United Nations, New York, 10017, USA, telephone (212) 963-3209, fax (212) 963-2147, email: population@un.org

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THE CORRESPONDENCE BETWEEN PROJECTED TOTAL FERTILITY AND CONTRACEPTIVE PREVALENCE USING THE PROXIMATE DETERMINANTS FRAMEWORK

*Stephen Kisambira**

INTRODUCTION

This paper assesses the correspondence of modelled projections of period total fertility and contraceptive prevalence. The results from this paper can inform analyses of the impact on aggregate fertility levels (and hence population size) of accelerating access to and meeting demand for contraceptive methods, within the context of changes in the proximate determinants of fertility.

The Population Division of the Department of Economic and Social Affairs of the United Nations is a key source for estimates and projections of fertility and total population as well as family planning indicators. Every two years the Population Division prepares a new revision of *World Population Prospects* (WPP), the official population estimates and projections of the United Nations. To project the population for individual countries, the Population Division uses the cohort-component projection method, which provides an accounting framework for the three demographic components of change—fertility, mortality and international migration—and relates them to the population. The projections of fertility (to 2100) are generated using probabilistic methods informed by historical trends within a country, the variability in historical fertility trends of all countries that have already experienced a fertility decline, and the past experience of all other countries at similar levels of fertility (Alkema et al., 2011; United Nations, 2013a, 2014a). The Population Division also regularly assesses and compiles data on contraceptive prevalence and unmet need for family planning. More recently, model-based estimates and projections of contraceptive prevalence and other family planning indicators were produced for the period from 1970 to 2030 based on a probabilistic approach informed by historical trends in family planning and accounting for differences by data source, sample population, and contraceptive methods included in the measure (see Alkema et al., 2013 for methodological details; United Nations, 2013b).

Recent studies for selected countries and regions have estimated the level of projected fertility that would be associated with variants of the annual increase in contraceptive use during the period 2010-2050, taking into account the likely changes in the other proximate determinants of fertility, and comparing the results with the high, medium and low fertility variants of the United Nations projections (Guengant and May, 2011; Moreland and Smith, 2012). These studies suggest that achieving fertility levels for the period 2010-2050 that are consistent with the fertility projections from the 2008 and 2010 revisions of *World Population Prospects* would require higher annual increases in contraceptive use than those observed in recent years.

This paper assesses the correspondence between independently-generated probabilistic projections of period total fertility and contraceptive prevalence. New variants of fertility and contraceptive prevalence for a 25-year projection period (2010-2035) are generated using the proximate determinants of fertility framework and using as time-varying inputs either total fertility projections from WPP or model-based projections of contraceptive prevalence. These new variants are then compared with the median and 80 per cent prediction interval of the probabilistic projections of total fertility or contraceptive prevalence. The analyses presented in this paper are based on estimates and projections for countries or areas with 90,000 persons or more in 2013, as published by the United Nations in 2013: specifically, the 2012 Revision of *World Population Prospects* (United Nations, 2013a), *Model-based Estimates and Projections of Family Planning Indicators 2014* (United Nations, 2014b) and *Estimates and Projections*

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of the Number of Women Aged 15-49 Who Are Married or in a Union: 2013 Revision (United Nations, 2013b).

PROXIMATE DETERMINANTS OF FERTILITY FRAMEWORK AND INPUT DATA

The proximate determinants of fertility framework (Bongaarts, 1978; Bongaarts and Potter, 1983; Bongaarts and Stover, 1986) and the related spreadsheet developed by The Futures Group International[1] are used to assess the correspondence between projected total fertility and contraceptive prevalence, net of other proximate determinants. The framework in its revised form includes five intermediate fertility variables (proportion married, postpartum infecundability, contraception, induced abortion and pathological sterility) that are key direct determinants of fertility (Bongaarts et al., 1984). Each of these determinants is assumed to independently inhibit fertility. However, problems can arise when different determinants overlap (for example, between postpartum amenorrhoea and contraceptive use) and the framework is used to project future changes in fertility as a result of assumed changes in the determinants (Stover, 1998).

The equation relating the total fertility rate to the proximate determinants for the base year, 2010, is expressed as:

$$\text{TFR} = TF \times C_m \times C_c \times C_a \times C_i \times C_s$$

Where:
TFR = total fertility rate
TF = total fecundity
C_m = index of marriage
C_c = index of contraception
C_a = index of induced abortion
C_i = index of postpartum infecundability
C_s = index of sterility

Each of the proximate determinants is measured using an index that varies between 0 and 1, where a value of 1 means no reduction of fecundity (and, hence, no reduction in fertility) and values below 1 indicate a reduction effect on fertility attributable to the determinant. For example, if all women were married by age 15, the marriage index would take on a value of 1, yielding no reduction of fertility attributable to non-marriage.

If all of the indices can be estimated, then the resulting period total fertility rate (TFR) represents the number of children that would be born to a woman if she were to live through her childbearing ages (15-49 years) and bear children in accordance with current age-specific fertility rates. The TFR reflects the inhibiting effects of five of the key proximate determinants on the maximum total fecundity (Bongaarts et al., 1984). However, the underlying fecundity will vary with age and other unmeasured components of the model (Johnson et al., 2011). Also, estimates of total fecundity will vary with the extent to which the proximate determinants overlap, for example, between contraceptive use and postpartum amenorrhoea and between infecundity and sterilization. Estimates from empirical data showed an average of 15.3 births per woman for the total fecundity rate for the reproductive period extending from age 15 to 44 years, with

[1] Proximate Determinants of Fertility: Demonstration Worksheet prepared by The Policy Project (1997). The Futures Group International. See http://futuresgroup.com/resources/software_models/proximate_determinants_of_fertility (accessed 4 April 2014).

minor variations among human sub-populations ranging from 13.5 to 16.5 children per woman due to waiting time to conception, risk of intrauterine mortality and the onset of permanent sterility (Bongaarts and Potter, 1983). A revision of the framework in which the reproductive age group is defined as extending from age 15 to 49 years implies total fecundity of about 21 with a range of about 18 to 24 (Stover, 1998). Nonetheless, estimates of TF may exceed its theoretical limits because of a large error term in the proximate determinants framework, attributed in a large part to the effects of unmeasured factors exogenous to the framework. The assessment in this paper is not concerned with the validity of TF values in relation to their theoretical values in the base year.

The index of marriage (C_m) represents the fraction of the reproductive period lost due to postponement of marriage. This index represents the effect of non-marriage in terms of reduction in fertility per woman. It is defined as the ratio between the total fertility rate (TFR) and the total marital fertility rate (TM). That is:

$$C_m = \text{TFR/TM} = \frac{\sum f(a)}{\sum f(a)/m(a)}$$

Where $m(a)$ equals the proportion married among females, by age, and $f(a)$ is a schedule of age-specific fertility rates among married women.

In practice, however, the proportion of women of reproductive age (15-49 years) who are married or in a consensual union can be used as an approximation of C_m. That is:

$C_m \sim$ MWRA/WRA

Where:
MWRA = Married or in-union women of reproductive age
WRA = All women of reproductive age

This approximation would mis-estimate the effect of non-marriage where non-marital childbearing is common, such as in parts of Europe, Latin America and the Caribbean. In the original formulation of C_m, non-marital fertility is captured by the total fertility rate.

The index of marriage, C_m, equals 1 if all women of reproductive age are in marriage or a consensual union during the entire reproductive period and 0 in the absence of such unions. Data on the number of women aged 15-49 who are married or in union (United Nations, 2013b) and the number of women aged 15-49 (United Nations, 2013a) are used to calculate the proportion of women who are married or in union for each country or area for the period 2010 to 2030. Projections of the number of married or in union women are not available for the year 2035, thus the proportions of married or in-union women for 2030 are held constant to 2035.

The index of contraception (C_c) takes into account both the level of contraceptive prevalence and the average effectiveness of contraceptive methods used. If all couples who use contraception are assumed non-sterile, the index of contraception is estimated as:

$C_c = 1 - 1.08ue$

Where u is the proportion of married or in-union women in the reproductive ages who are currently using contraception, and e is the average of use-effectiveness of contraception as practiced in the population.

The average effectiveness of contraceptive use is calculated by multiplying the proportions of current contraceptive users of each method by the arithmetical complement of the proportion of users who become pregnant during the first 12 months of typical use of the specific method, and then summing over all methods. Pregnancy rates from typical use of a method are based on the experience of women in the United States, corrected for under-reporting of abortion (Trussell, 2011). Estimates of the method-specific effectiveness are: Female sterilization (0.995), male sterilization (0.999), pill (0.910), injectable (0.940), implant (0.999), IUD (0.995), male condom (0.820), vaginal barrier methods (0.880), other modern methods (0.790) and traditional methods (0.770).

Data on the distribution of contraceptive users by method, obtained from the most recent surveys (2000-2012) covering nationally representative samples of married or in-union women of reproductive age (see Biddlecom and Kantorova, 2013) are applied to the model-based median estimates and projections of modern contraceptive prevalence to obtain the average method mix effectiveness for each reference year over the period 2010-2035. Higher values of average method mix effectiveness signify a more effective method mix profile and, by implication, fewer unintended pregnancies among women who use contraception. The distribution of specific traditional methods is not examined, considering that the typical use-effectiveness of traditional methods is similar across the main traditional methods used. The proportion of total users of traditional methods for each projection year is calculated as the residual of total users of all contraceptive methods minus the proportion of total users of modern methods.

The index of abortion (C_a) represents the proportion by which the TF is reduced due to induced abortion. Births averted per induced abortion are related to contraceptive use (Potter, 1972). During a woman's reproductive period, an induced abortion averts about 0.4 births in the absence of contraception and about 0.8 births when moderately effective contraception is used. The index of abortion is defined as the ratio of the observed TFR to the estimated TFR without induced abortion, and declines with increasing incidence of induced abortion (Bongaarts, 1978). This index is calculated as follows:

$$C_a = TFR/(TFR + 0.4 \times (1 + u) \times TA)$$

where TFR = total fertility rate;

u = the proportion protected by contraception among women who have an induced abortion, but which is taken to equal the proportion of married or in-union women using contraception; and,

TA = total abortion rate, equal to the average number of induced abortions per married or in-union woman at the end of the reproductive period if induced abortions remain at prevailing levels throughout the reproductive period.

The calculation of the abortion index includes the total fertility rate and the contraceptive prevalence rate. Therefore, if the abortion rate is not set to 0, it can affect the required level of contraceptive prevalence, even if it remains constant (Stover et al., 2006). The index of induced abortion equals 1 in the absence of induced abortion and 0 if all pregnancies are aborted. Estimates and projections of contraceptive prevalence are available for the period 2010-2035 (United Nations, 2014b). However, reliable data on the total abortion rate are not available in the majority of countries. Estimates of abortion rates in 1995, 2003 and 2008 are available for all the major regions and subregions of the world (Sedgh et al., 2012). Subregional estimates of abortion rates in 2008 are used for all countries in these geographical areas. It is presumed that the abortion rates prevailing in 2008 will remain constant throughout the

projection period, given that abortion rates were relatively stable between 2003 and 2008 in most subregions (Sedgh et al., 2012).

The index of postpartum infecundability (C_i) represents the reduced risk of exposure to conception immediately following a birth. The period of postpartum infecundability operates entirely through modification of the birth interval (Bongaarts and Potter, 1983). In the absence of any breastfeeding (and postpartum abstinence), the average birth interval is around 20 months, which includes four segments: a period of postpartum amenorrhoea (1.5 months), the average waiting time to conception (7.5 months), time added by spontaneous intrauterine mortality (2 months) and 9 months of a full term pregnancy. The last three segments are assumed constant and sum up to 18.5 months. Postpartum amenorrhoea is extended by breastfeeding and abstinence. The index of postpartum infecundability is estimated by the ratio of the average birth interval where breastfeeding and abstinence are absent, and the length of a birth interval where the period of postpartum infecundability is extended by breastfeeding and abstinence:

$$C_i = 20/(18.5 + i)$$

where C_i = index of postpartum infecundability; and i = average duration of postpartum infecundability due to breastfeeding and postpartum abstinence.

In the absence of breastfeeding and abstinence, i would be equal to 1.5, its minimum possible value, and C_i would equal 1. As the duration of postpartum infecundability increases, C_i declines and it would tend towards 0 if the duration of postpartum infecundability were to continue indefinitely. National data on the median duration of postpartum infecundability are taken from the *FamPlan* module of the Spectrum Policy Modeling System developed by The Futures Group (Stover et al., 2006). Data for the most recent period up to the year 2011 are available for 165 countries. The weighted sub-regional or regional averages are used for countries where data on postpartum infecundability are not available.

The index of sterility (C_s) represents the incidence of natural infertility and pathological sterility. Evidence from a number of studies suggests a pattern of natural infertility that increases with a woman's age and postponement of first motherhood (te Velde et al., 2012). Natural infertility is at its lowest level among women in their early 20s (3 per cent), which provides the lifetime benchmark proportion of childless women in populations where virtually all women are exposed to conception during their reproductive period (Bongaarts et al., 1984). It is difficult to assess the level of sterility or involuntary childlessness because of the lack of data on secondary infertility and also, in many countries, increasing numbers of fertile women and men are remaining voluntarily childless for various reasons. However, the increasing use of assisted reproductive technologies (ART) suggests that many men and women are involuntarily childless; they may also have a lower ability to conceive (Priskorn et al., 2012).

Previous studies have used the proportion of either all or ever-married women aged 40-44 or 45-49 or 40-49 who are childless to measure the level of sterility in a population, which could be due to natural and pathological causes. It is estimated that in a population of women, half of them are menopausal at the end of their 40s (Bongaarts et al., 1984). In natural fertility populations, age at last birth occurs on average 10 years earlier than age at menopause (te Velde and Pearson, 2002). In sub-Saharan Africa, it is assumed that the majority of women have had their first birth by the age of 40 years (Jolly and Gribble, 1993). In this analysis, the percentage of women aged 45-49 who are childless is used to obtain the index of sterility. Thus, it is presumed that all women attempt to have at least one child.

The index of sterility is estimated based on a 3 per cent standard level of childlessness as follows:

$$C_s = (7.63 - 0.11s) / 7.3$$

where s = per cent of women aged 45-49 years who have never had any children.

Data on the proportion of childless women aged 45-49 are taken from the most recent national census and surveys prior to 2010 (Stover et al., 2006; United Nations, 2011, 2013c), which are applied to both the base year (2010) and projection years; that is, the proportion of childless women is held constant from the base year. For countries where data on childlessness are not available, the weighted sub-regional or regional averages are used.

Assessment of projected total fertility rates

In projecting future fertility levels, it is possible to calculate the TF from the TFR for the base year if the indices of proximate determinants are known. That is,

$$TF = TFR/(C_m \times C_c \times C_a \times C_i \times C_s)$$

The future trends of the indices can then be applied to the total fecundity rate for the base year to estimate the projected total fertility rates. For each country and region, we obtain the TF by dividing the estimated TFR in 2010 by the multiplicative reductions of the five indices in 2010, which take on values between zero and one. The country-specific TF value in the base year is held constant over the projection period in order to assess if the model-based projections of total fertility and contraceptive prevalence are reasonably aligned with one another over time.

Other factors affecting total fecundity that are measured (e.g., induced abortion and pathological sterility) and not measured (e.g., frequency of intercourse, incidence of spontaneous abortion) are assumed to remain constant over time. This assumption may not hold true if significant changes occur in the factors that affect TF, such as changing trends in the prevalence of pathological sterility or in spousal separation (Bongaarts, 1984) or changing trends in the overlap between factors (Stover, 1998). The equation relating the projected total fertility rate to the proximate determinants for the projection year is expressed as:

$$TFR_t = TF \times C_{mt} \times C_{ct} \times C_{at} \times C_{it} \times C_{st}$$

where:
TFR_t = projected total fertility rate for projection year t
TF = total fecundity in base year
C_{mt} = index of marriage for projection year t
C_{ct} = index of contraception for projection year t
C_{at} = index of induced abortion for projection year t
C_{it} = index of postpartum infecundability for projection year t
C_{st} = index of sterility for projection year t

In this assessment, estimates of total fecundity among 184 countries range from 4.3 to 34.1 (inter-quartile range of 11.7 to 19.1) when Bongaarts' original proximate determinants framework is applied, and from 4.1 to 31.3 (inter-quartile range of 10.3 to 17.5) when the revised model (Stover, 1998) is applied, removing the infecundity consideration from the contraceptive index because it is already included in the sterility index. As indicated already, estimates of TF may exceed its theoretical limits depending on whether all of the indices can be estimated. The assessment in this paper is not concerned with the validity of TF values per se but rather the use of the proximate determinants framework as a tool to generate new, country-specific variants of total fertility and contraceptive prevalence projections from a base year estimate of TF that is calculated from a total fertility estimate from WPP 2012 and a contraceptive prevalence estimate from the model-based series. The other indices used to estimate the

country-specific TF in the base year are also used to estimate the new variants of projected fertility and contraceptive prevalence, thus ensuring internal consistency.

Using the original proximate determinants framework,[2] a new total fertility variant was generated for all regions and countries of the world using the 2014 revision of model-based estimates and projections of contraceptive prevalence (median) as an input to the proximate determinants framework. The new variant was then compared to the medium-fertility variant of the 2012 Revision of *World Population Prospects* (WPP 2012) (i.e., the median of the probabilistic projection trajectories) and the 80 per cent prediction interval for the years 2020, 2025, 2030 and 2035. Thus, the objective of this part of the assessment was to determine whether the median projected contraceptive prevalence implies a total fertility variant, based on the proximate determinants framework, that is close to the independently-generated total fertility projections based solely on historical trends in total fertility.

Assessment of projected contraceptive prevalence

The equation relating the index of contraception for the projection year to the projected total fertility rate and the proximate determinants is expressed as:

$C_{ct} = TFR_t / (TF \times C_{mt} \times C_{at} \times C_{it} \times C_{st})$

At the same time, the index of contraception for the projection year t, $C_{ct,}$ has the following relationship:

$$C_{ct} = 1 - 1.08 u_t e_t$$

where u_t is the proportion of married or in-union women of reproductive age who are currently using contraception in projection year t, and e_t is the average use-effectiveness of contraception in projection year t. The average effectiveness of contraceptive use will change as the contraceptive method mix and contraceptive prevalence change.

Thus, the implied rate of contraceptive use corresponding to the projected total fertility rate is calculated as:

$$u_t = (1 - C_{ct}) / 1.08 e_t$$

A new contraceptive variant was then generated using the total fertility rates from the WPP 2012 medium variant as an input to the proximate determinants framework for all regions and countries of the world and compared to the median and 80 per cent prediction interval of the modelled projections of contraceptive prevalence. Thus, this part of the analysis examined whether the median projected total fertility rate implies a projected level of contraceptive prevalence, based on the proximate determinants framework, that is close to the model-based projections of contraceptive prevalence that rely on historical trends in contraceptive prevalence.

[2] There is no difference in the majority of countries between the projected TFRs in 2020 according to whether the original or revised model is applied: the difference in the projected TFRs between models in 2020 ranges from -0.14 to 0.12 in all countries (data not shown).

RESULTS

Comparison of total fertility rates implied by projected contraceptive prevalence and those from the WPP 2012 medium variant

The panels in figure 1 show how the total fertility rates projected using the proximate determinants framework (proximate-determinants TFRs) compare with the total fertility rates from the WPP 2012 medium variant (WPP TFRs) for the projection years 2020, 2025, 2030 and 2035. The correspondence between the two fertility variants is also shown by the regional median values in table 1. The total fertility variant calculated using the proximate determinants framework tracks closely the WPP TFRs in 2020 (figure 1). In the majority of countries in European and Northern America, the proximate-determinants TFRs are lower than the WPP TFRs in the majority of countries in Europe and Northern America and higher than the WPP TFRs in Latin America and the Caribbean.

By 2025 and 2035, the difference between the two projected variants of total fertility grows wider in Africa, Europe and Northern America and Latin America and the Caribbean. In 2035, the proximate-determinants TFRs are lower than the WPP TFRs in 92 out of 184 countries. The majority of these countries are in Africa (29), Asia (23) and in all countries in Europe and Northern America except four (Malta, Norway, United Kingdom and United States of America). In only five countries in Latin America and the Caribbean (Cuba, Guyana, Panama, and Trinidad and Tobago) and three countries in Oceania (Australia, Kiribati and Samoa) are proximate determinants TFRs lower than the WPP TFRs. Also, in 2035, the proximate-determinants TFRs are lower than the WPP TFRs in 54 out of 104 countries with total fertility rates of 2.0 and below (figure 1 and annex table 1) and total fertility rates of 3.0 and above (27 out of 39 countries).

The proximate-determinants TFRs are compared with the WPP TFRs to assess whether the two fertility variants are close. For each country and for each projection year, the WPP TFR is subtracted from the proximate-determinants TFR to obtain the difference between the two fertility variants. The semi-interquartile range of the differences between the two fertility variants is then used to filter out the outliers below and above the median value of the differences between the two fertility variants. In 2020, the semi-interquartile range of the differences between the two fertility variants is 0.14 children in 2020, 0.17 children in 2025, 0.22 children in 2030 and 0.24 children in 2035. In figure 2, the proximate-determinants TFRs are defined as close to WPP TFRs if their values were equal to, or less than, 0.2 children apart. The two TFR variants are close particularly at contraceptive prevalence rates above 60 per cent in the majority of countries and throughout the projection period.

Figure 3 shows the distribution of countries by major area according to whether the difference between the proximate-determinants TFR and the WPP TFR is within 0.2 children. The two fertility variants are close in a large proportion of countries in Asia and Oceania throughout the projection period. By 2025, in the majority of countries in Africa, Asia and Oceania, the model-based contraceptive prevalence rates imply a total fertility variant, based on the proximate determinants framework, that is close to the independently-generated WPP TFRs. By 2035, the difference between the two fertility variants is large for an increasing proportion of countries in Africa and Latin America and the Caribbean.

In figure 4, the new fertility variant generated using the proximate determinants framework is compared with the prediction intervals of the WPP TFRs to determine whether the new fertility variant for each country lies within the 80 per cent prediction interval of the WPP TFRs. In 2020, in only 20 countries out of 184 are the proximate-determinants TFRs outside of the 80 per cent prediction interval (table 2). By 2025, the proximate-determinants TFRs are outside of the 80 per cent prediction interval in 33 countries, and increase to 46 and 43 countries in 2030 and 2035, respectively. In 2035, the majority of these countries are in Europe (15 countries), Latin America and the Caribbean (16 countries) and Africa

(8 countries). Also, figure 4 shows that the proximate-determinants TFRs below replacement level are closer to the lower bounds of the 80 per cent prediction interval in almost all countries of Europe and Northern America and closer to the upper bounds of the 80 per cent prediction interval in the majority of countries in Latin America and the Caribbean.

Comparison of levels of contraceptive prevalence implied by projected total fertility rates and those from model-based projections of contraceptive prevalence

The contraceptive prevalence rates implied by projected TFRs from the WPP 2012 medium variant (calculated using the proximate determinants framework) are compared to the model-based projections of contraceptive prevalence in 2020, 2025, 2030 and 2035 (figure 5). There is a close match in 2020 and 2025 between the implied contraceptive prevalence (based on the total fertility rates from the WPP 2012 medium variant) and the model-based contraceptive prevalence in the majority of countries, except in Europe and Northern America. The median values of the two variants of contraceptive prevalence show a closer match among countries of Asia and Oceania than among the countries in other regions (table 3). In Africa, the median of the implied contraceptive prevalence is higher than the model-based contraceptive prevalence in 2020 but lower between 2025 and 2035. In Europe and Northern America, the median of the implied contraceptive prevalence is lower than the model-based contraceptive prevalence throughout the projection period, and by larger margins than in other regions. In Latin America and the Caribbean, the median of the implied contraceptive prevalence is higher than the median of the model-based contraceptive prevalence throughout the projection period. The differences between the medians of the two projected variants of contraceptive prevalence grow wider the farther into the projection period in Europe and Northern America and Latin America and the Caribbean (table 3). Also, the differences between the two projected variants of contraceptive prevalence are wider in Europe and Northern America and Latin American and the Caribbean than in other regions.

In figure 6, the total fertility rates from the WPP 2012 medium variant, and the contraceptive prevalence rates they imply, are compared with the model-based contraceptive prevalence. The implied contraceptive prevalence rates correspond with the model-based contraceptive prevalence rates around replacement-level fertility in each projection year, suggesting a robust relationship between the model-based contraceptive prevalence rates and the WPP TFRs when fertility is low.

The two projected variants of contraceptive prevalence are further compared to assess whether the WPP TFRs imply a contraceptive prevalence projection, based on the proximate determinants framework, that is close to the model-based projections of contraceptive prevalence that rely on historical trends in contraceptive prevalence (figure 7). For each country and for each projection year, the model-based contraceptive prevalence rate is subtracted from the contraceptive prevalence rate implied by the WPP TFRs to obtain the difference between the two variants of contraceptive prevalence. The semi-interquartile range of the differences between the two variants of contraceptive prevalence is then used to filter out the outliers below and above the median value of the differences between the two variants of contraceptive prevalence. The semi-interquartile range of the differences between the two contraceptive prevalence variants is 2.4 per cent in 2020, 3.4 per cent in 2025, 4.3 per cent in 2030 and 4.5 per cent in 2035. The two variants of contraceptive prevalence are defined as close if their values were less than 5 percentage points apart, based on the semi-interquartile range of the differences between the two contraceptive prevalence variants in 2035.

The distribution of countries according to the difference between the implied contraceptive prevalence rates and the model-based contraceptive prevalence rates is shown in figure 7. The WPP TFRs imply contraceptive prevalence rates, based on the proximate determinants framework, that are close to the model-based projections of contraceptive prevalence (that rely on historical trends in contraceptive prevalence) in 156 out of 184 countries in 2020, in 135 countries in 2025, in 116 countries in 2030 and in

108 countries in 2035. The two variants of contraceptive prevalence are closer in a larger proportion of countries in Asia, Latin America and the Caribbean than in Africa and Europe and Northern America.

Between 2025 and 2035, the difference between the two variants of contraceptive prevalence grows wider (to more than 10 percentage points) in the majority of countries with total fertility rates below 2.0 and above 3.0 (figure 8). By 2035, the implied contraceptive prevalence rates based on the WPP TFRs are lower than the model-based contraceptive rates in the majority of countries in Africa (28 out of 54), Asia (26 out of 47), Europe and Northern America (35 out of 39) and in 5 out of 9 countries in Oceania (annex table 2). The implied contraceptive prevalence rates are lower than the model-based rates by at least 10 percentage points in 11 African countries (Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Somalia, Sudan, Uganda, Tanzania and Zambia), three Asian countries (Armenia, Georgia and Japan), and 12 European countries (Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Italy, Lithuania, Montenegro, Romania, Serbia, Spain, TFYR Macedonia and Ukraine). The implied contraceptive prevalence rates in 2035 are higher than the model-based rates by at least 10 percentage points in three African countries (Botswana, Cabo Verde and Equatorial Guinea) and in Afghanistan and Grenada.

In Latin America and the Caribbean, the implied contraceptive prevalence rates based on the WPP TFRs in 2035 are higher than the model-based rates in all countries except four (Cuba, Guyana, Panama and Trinidad and Tobago). As shown in figure 1 for this region, it is only in these four countries where the proximate-determinants TFRs in 2035 are lower than the WPP TFRs. Also, as shown by the differences between the medians of the two projected variants of contraceptive prevalence in table 3, the differences between the two variants of contraceptive prevalence grow wider in this region.

Figure 9 compares the contraceptive prevalence variant using the proximate determinants framework with the 80 per cent prediction interval of the model-based projections of contraceptive prevalence. In the majority of countries, the contraceptive prevalence rates implied by the WPP TFRs fall within the 80 per cent prediction interval of the model-based projections of contraceptive prevalence. Table 4 shows countries where the contraceptive rates implied by the WPP TFRs fall outside the 80 per cent prediction interval. In 2035, the implied contraceptive prevalence rates fall below the lower value of the 80 per cent prediction interval in 11 countries (Bosnia and Herzegovina, Bulgaria, Georgia, Italy, Japan, Mali, Mozambique, Niger, Nigeria, Serbia and TFYR Macedonia), and in only one country (Grenada) does it fall above the upper value of the 80 per cent prediction interval.

CONCLUSIONS

This assessment of the independent, model-based projections of period total fertility and contraceptive prevalence shows that:

- The model-based projections of contraceptive prevalence imply period total fertility (using the proximate determinants framework) that is close to the total fertility rates from the WPP 2012 medium variant (i.e., within 0.2 children per woman) for most countries and major areas from 2020 to 2035. In addition, the total fertility variant calculated using the model-based projections of contraceptive prevalence also falls within the 80 per cent prediction interval of the total fertility rates from the WPP 2012 probabilistic projections for 164 countries in 2020 and 141 countries by 2035.

- Total fertility implied by the model-based projections of contraceptive prevalence tends to be lower than the WPP TFRs in the majority of countries in Europe and Northern America and higher in the majority of countries in Latin America and the Caribbean, regardless of the projection period. In Africa and Asia, the differences are proportionally distributed in both

directions. Also, the difference between the two variants of the projected TFRs is widest in Latin America and the Caribbean followed by Africa.

- Differences between the two projected variants of total fertility grow wider in Africa, Europe and Northern America and Latin America and the Caribbean as the projection period extends from 2025 to 2035.

- The projected levels of contraceptive prevalence implied by the TFRs from the WPP 2012 medium variant (using the proximate determinants framework) approximates the model-based projections of contraceptive prevalence (i.e., less than five percentage points apart) in the majority of countries and major areas from 2020-2035. The contraceptive prevalence rates implied by the WPP TFRs also fall within the 80 per cent prediction interval of the model-based projections of contraceptive prevalence for 177 countries in 2020 and 172 countries by 2035.

- Differences between the two variants of contraceptive prevalence are larger in most countries and major areas of Europe and Northern America, Latin America and the Caribbean and Africa than in Asia and Oceania. Farther into the projection period, the differences grow wider for Europe and Northern America and for Latin America and the Caribbean, and by larger margins than for other regions.

- The implied contraceptive prevalence rates based on the WPP TFRs are lower than the model-based contraceptive rates for most countries and major areas of Africa, Asia and Europe and Northern America. From 2020 to 2035, the implied contraceptive prevalence is lower in most countries of Europe and Northern America, and higher in most countries of Latin America and the Caribbean, than the model-based contraceptive prevalence.

The independently-generated probabilistic projections of contraceptive prevalence imply a period total fertility variant, based on the proximate determinants framework, that is close to the independently-generated period total fertility projections (medium variant) based on historical trends in total fertility. It is reasonable in the majority of countries to benchmark future fertility, up to 2025, against the model-based contraceptive prevalence rates. Moreover, the model-based series can serve as an informative input to macro-level analyses of the impact on fertility and population size of accelerating access to and meeting the demand for contraceptive methods, within the context of changes in the proximate determinants of fertility.

TABLE 1. TOTAL FERTILITY RATES CALCULATED FROM MODEL-BASED PROJECTIONS OF CONTRACEPTIVE PREVALENCE, USING THE PROXIMATE DETERMINANTS FRAMEWORK, AND FROM THE WPP 2012 MEDIUM VARIANT

	Median total fertility rates							
	2020		*2025*		*2030*		*2035*	
	Prox. Det.	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*
Africa	4.2	4.2	3.7	3.9	3.3	3.6	3.2	3.4
Asia	2.2	2.1	2.0	2.0	1.9	1.9	1.9	1.9
Europe and Northern America	1.5	1.6	1.4	1.6	1.4	1.7	1.4	1.7
Latin America and the Caribbean	2.2	2.1	2.2	2.0	2.3	1.9	2.2	1.9
Oceania	2.8	2.7	2.7	2.6	2.4	2.5	2.3	2.4
All countries (N=184)	2.2	2.2	2.2	2.1	2.2	2.0	2.2	2.0

Source: (United Nations, 2013a, 2014b)

TABLE 2. COUNTRIES WHERE PROJECTED TOTAL FERTILITY RATES CALCULATED FROM MODEL-BASED PROJECTIONS OF CONTRACEPTIVE PREVALENCE, USING THE PROXIMATE DETERMINANTS FRAMEWORK, FALL OUTSIDE THE 80 PER CENT PREDICTION INTERVAL OF THE WPP 2012

	Year					*Year*			
Country or area	*2020*	*2025*	*2030*	*2035*	*Country or area*	*2020*	*2025*	*2030*	*2035*
Afghanistan	x	x	x	x	Japan	x	x	x	x
Algeria	x	x	x	x	Latvia	x	x	x	x
Antigua and Barbuda			x	x	Libya			x	
Bahamas		x	x	x	Lithuania	x	x	x	x
Barbados			x	x	Malawi		x	x	x
Belgium		x	x	x	Martinique			x	
Bosnia and Herzegovina	x	x	x	x	Namibia		x	x	x
Botswana		x	x	x	Netherlands	x	x	x	x
Brazil				x	Nicaragua		x	x	x
Bulgaria	x	x	x	x	Niger	x	x	x	
Cabo Verde	x	x	x	x	Oman	x	x		
China	x	x	x	x	Paraguay	x	x	x	x
Colombia	x	x	x	x	Peru			x	x
Costa Rica	x	x	x	x	Réunion			x	x
Croatia			x	x	Romania			x	x
Dominican Republic			x	x	Russian Federation		x	x	x
El Salvador			x	x	South Africa			x	x
Georgia		x	x	x	Spain		x	x	x
Germany		x	x	x	Swaziland	x	x	x	x
Greece		x	x	x	Ukraine		x	x	x
Grenada	x	x	x	x	United Kingdom			x	x
Guadeloupe			x		United States Virgin Islands	x	x	x	x
Honduras				x	Venezuela (Bolivarian Republic of)			x	x
Italy	x	x	x	x	Viet Nam	x	x		
Jamaica		x	x	x	Zambia			x	

Source: (United Nations, 2013a, 2014b)

TABLE 3. CONTRACEPTIVE PREVALENCE RATES CALCULATED FROM WPP 2012 MEDIUM-VARIANT FERTILITY, USING THE PROXIMATE DETERMINANTS FRAMEWORK, AND THE MODEL-BASED PROJECTIONS OF CONTRACEPTIVE PREVALENCE

	Median of contraceptive prevalence rates							
	2020		*2025*		*2030*		*2035*	
	Implied by Prox. Det.	*Model-based*	*Implied by Prox. Det.*	*Model-based*	*Implied by Prox. Det.*	*Model-based*	*Implied by Prox. Det.*	*Model-based*
Africa	34.5	32.2	36.9	38.2	41.0	43.9	45.7	48.6
Asia	59.7	59.7	60.7	61.4	61.6	63.1	63.1	64.1
Europe and Northern America	65.5	69.0	63.6	68.7	63.0	68.8	62.3	69.1
Latin America and the Caribbean	72.9	70.2	73.1	70.4	74.6	70.6	74.7	70.6
Oceania	46.6	44.9	47.4	46.8	48.8	48.6	51.1	50.2
All countries (N=184)	61.3	62.2	62.0	63.5	62.3	64.4	62.8	65.3

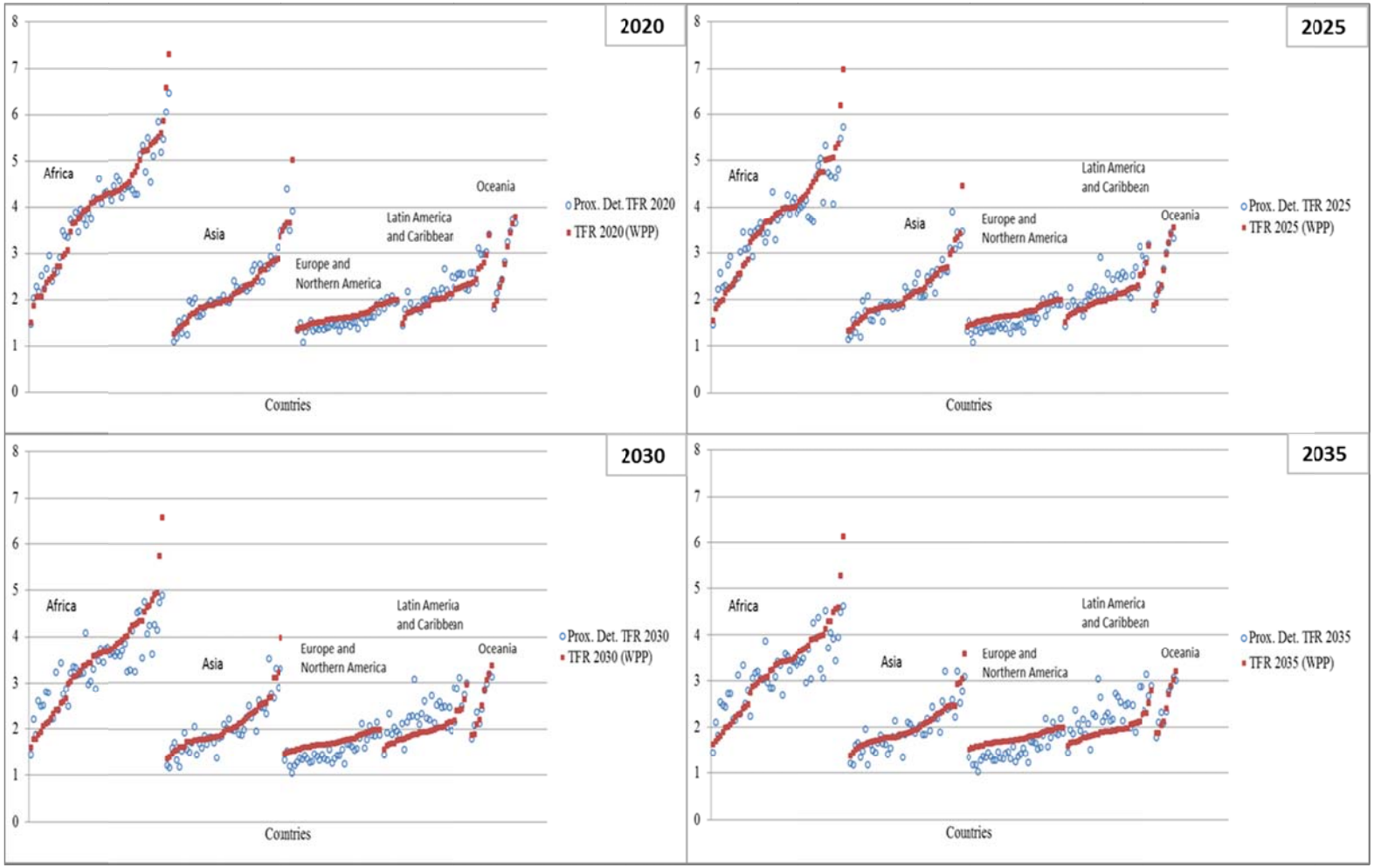
Source: (United Nations, 2013a, 2014b)

TABLE 4. COUNTRIES WHERE CONTRACEPTIVE RATES CALCULATED FROM WPP 2012 MEDIUM-VARIANT FERTILITY FALL OUTSIDE THE 80 PER CENT PREDICTION INTERVAL OF MODEL-BASED PROJECTIONS OF CONTRACEPTIVE PREVALENCE

	Year			
Country or area	*2020*	*2025*	*2030*	*2035*
Bosnia and Herzegovina	x	x	x	x
Bulgaria			x	x
Chad	x			
Gambia	x	x	x	
Georgia			x	x
Grenada			x	x
Italy				x
Japan		x	x	x
Mali	x	x	x	x
Mozambique		x	x	x
Niger	x	x	x	x
Nigeria	x	x	x	x
Serbia				x
TFYR Macedonia				x
Timor-Leste	x	x		

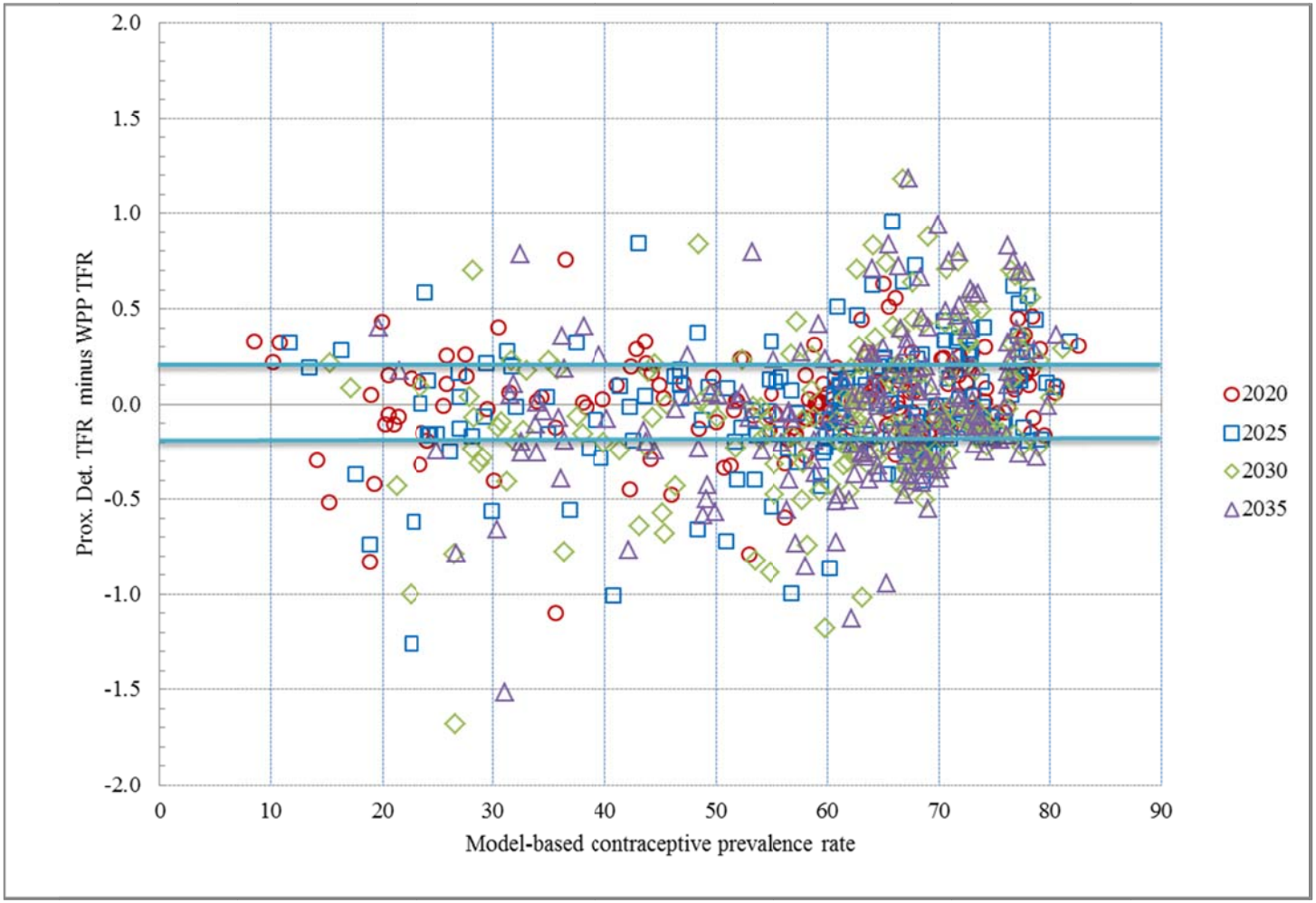
Source: (United Nations, 2013a, 2014b)

Figure 1. Country-specific total fertility rates implied by model-based projections of contraceptive prevalence, using the proximate determinants framework, and from the WPP 2012 medium variant, by region for 2020, 2025, 2030 and 2035



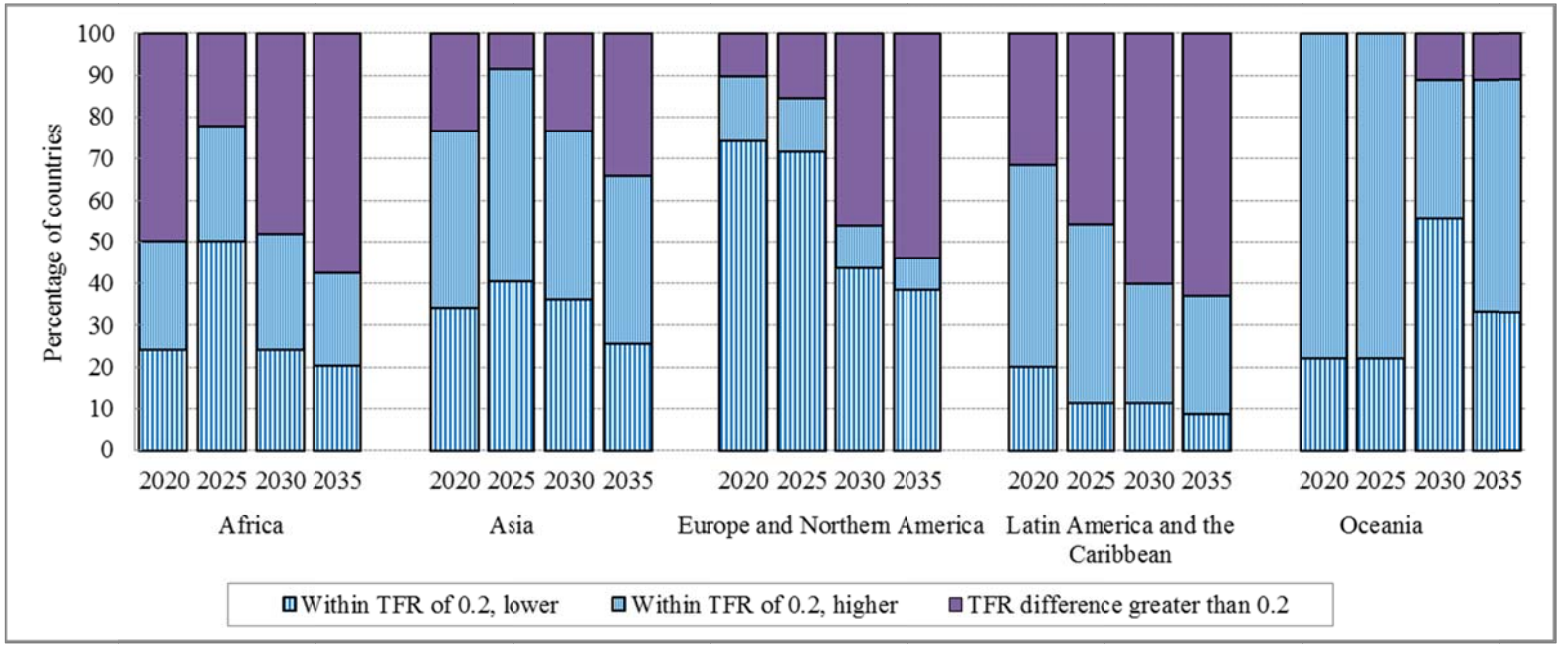
Source: (United Nations, 2013a, 2014b)

Figure 2. Differences between the total fertility rate implied by model-based projections of contraceptive prevalence and from the WPP 2012 medium variant, in relation to the model-based contraceptive prevalence, by country in 2020, 2025, 2030 and 2035



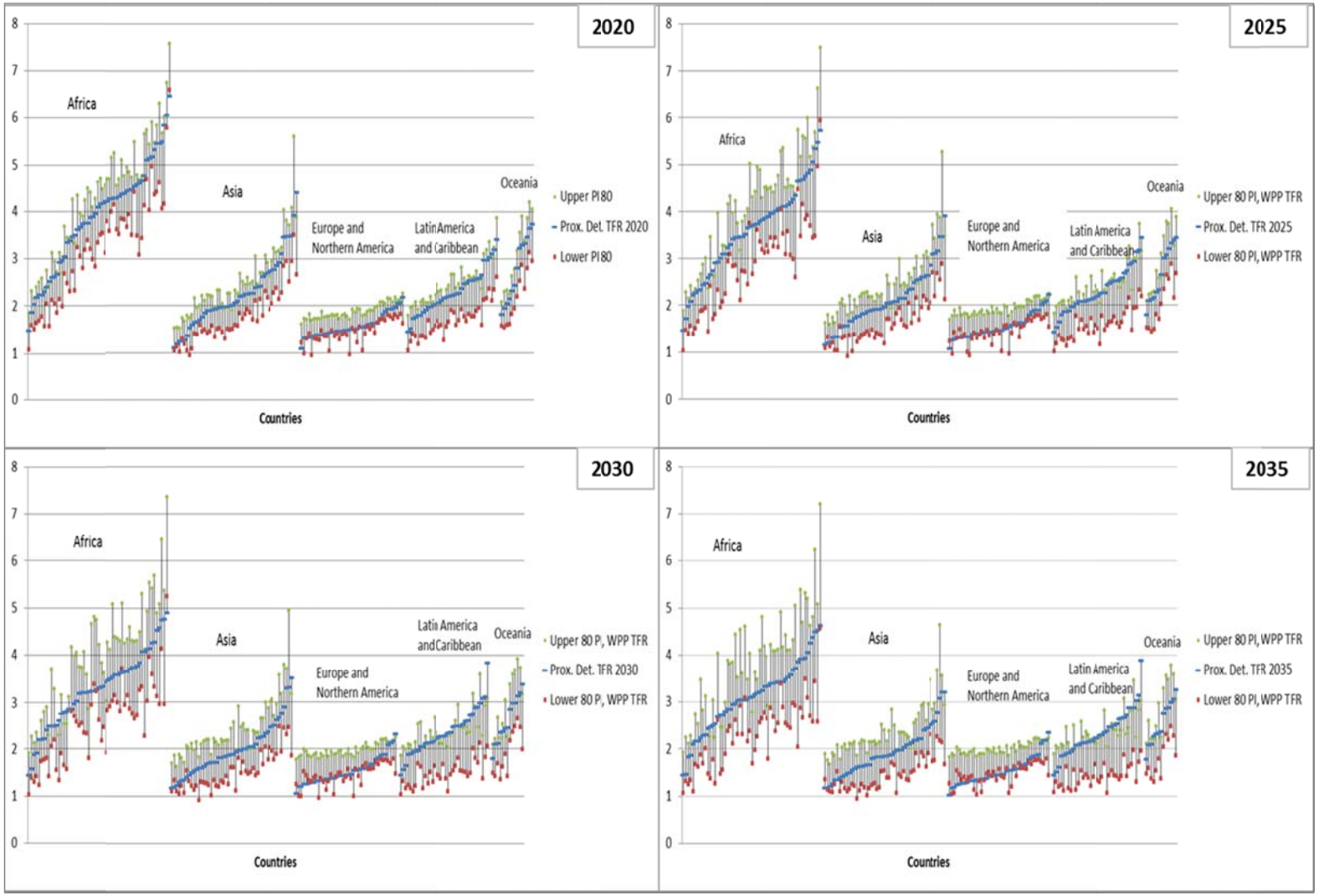
Source: (United Nations, 2013a, 2014b)

Figure 3. Distribution of countries, within regions, according to the difference between the total fertility rate implied by model-based projections of contraceptive prevalence and from the WPP 2012 medium variant, in 2020, 2025, 2030 and 2035



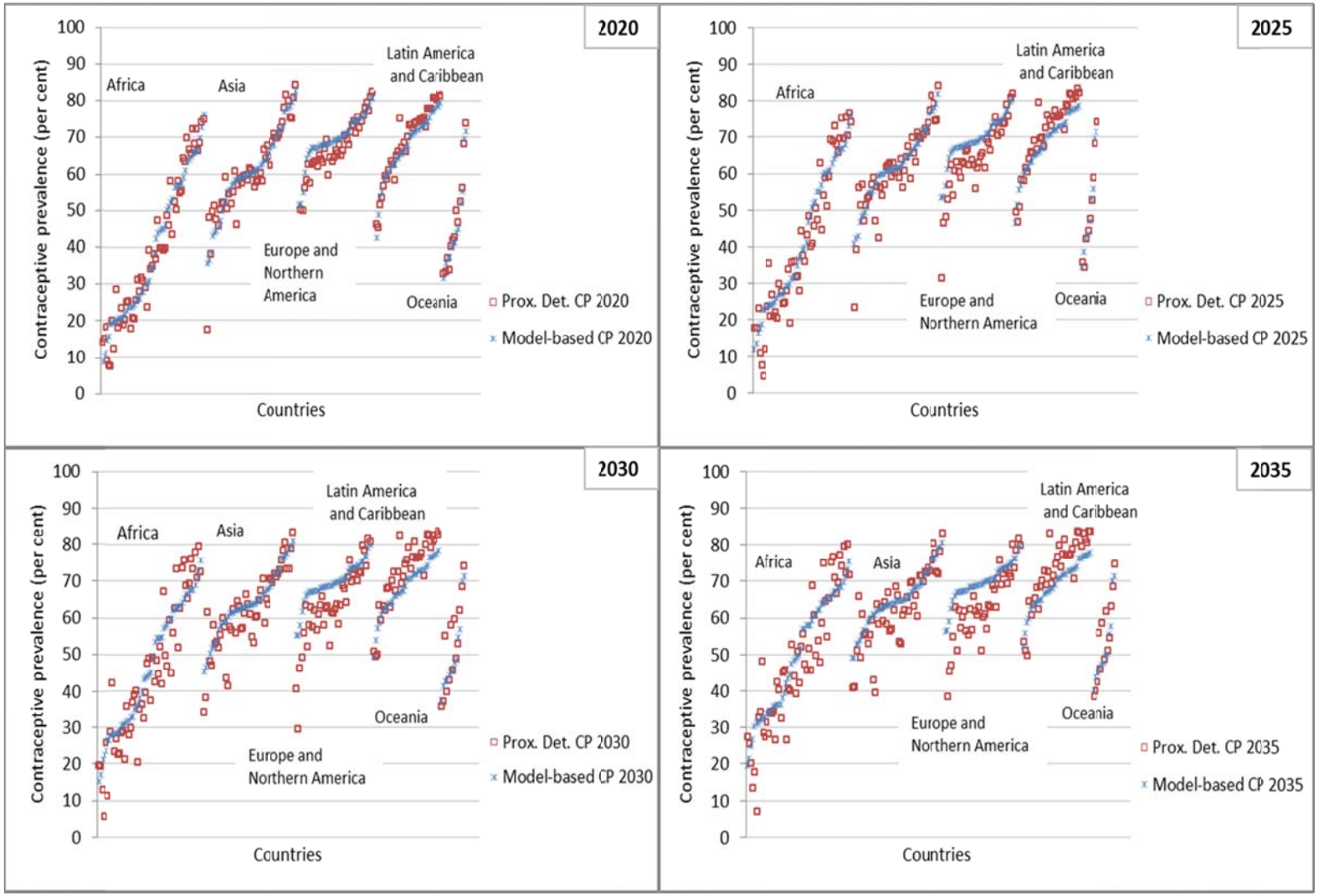
Source: (United Nations, 2013a, 2014b)

Figure 4. Country-specific total fertility rates derived from model-based projections of contraceptive prevalence, using the proximate determinants framework, and the 80 per cent prediction interval of the total fertility rate from the WPP 2012, in 2020, 2025, 2030 and 2035



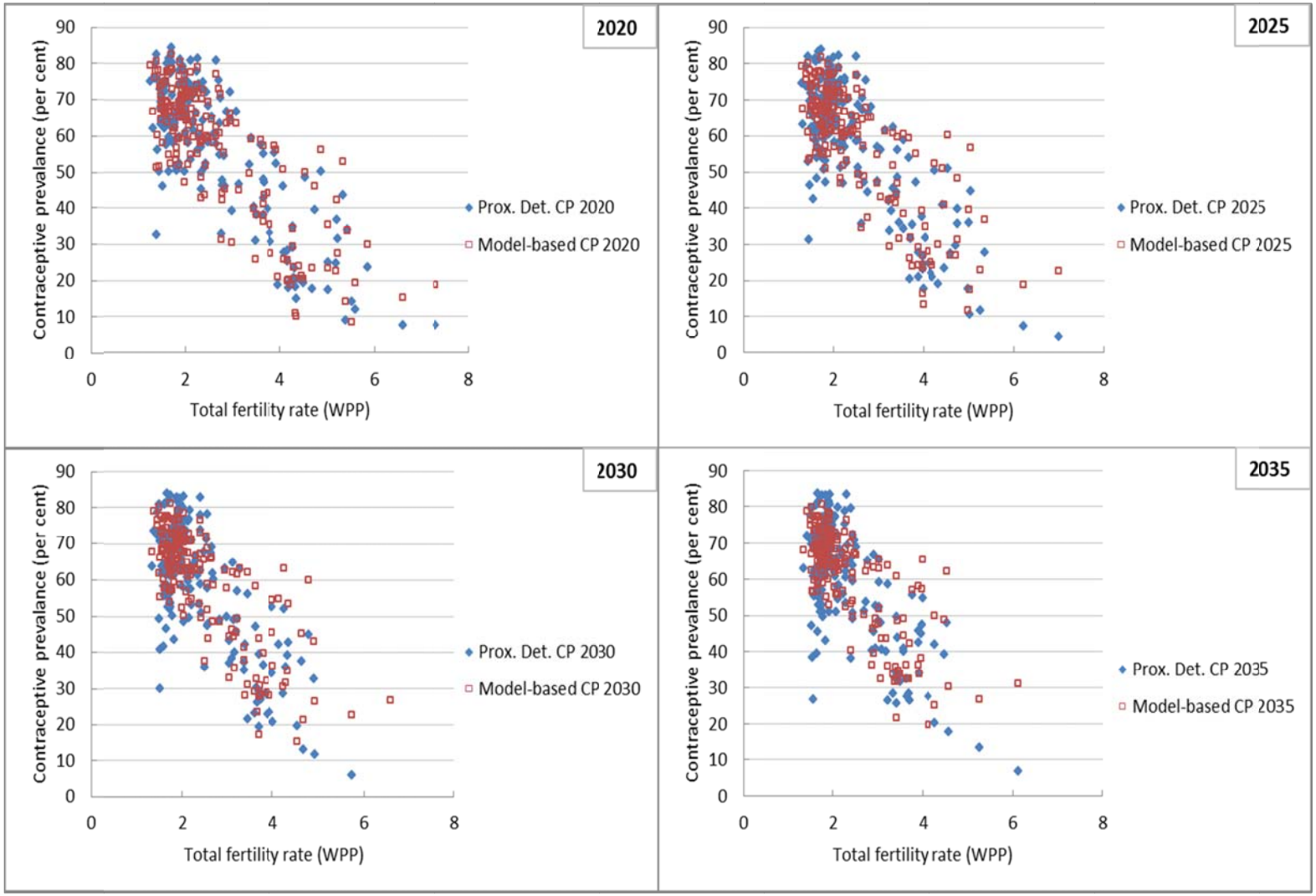
Source: (United Nations, 2013a, 2014b)

Figure 5. Contraceptive prevalence implied by the WPP 2012 medium-variant projections of the total fertility rate, using the proximate determinants framework, and from model-based projections of contraceptive prevalence, in 2020, 2025, 2030 and 2035



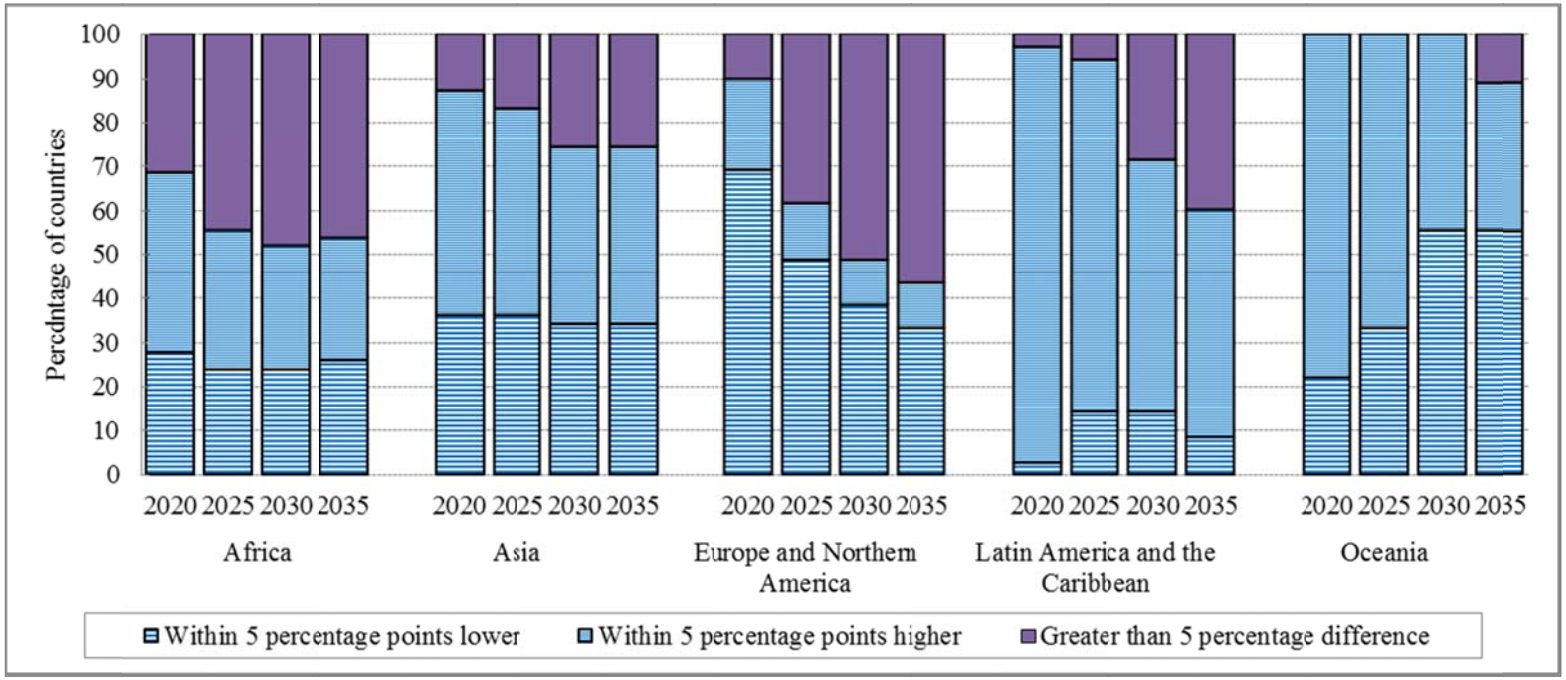
Source: (United Nations, 2013a, 2014b)

Figure 6. Projected total fertility rates from the WPP 2012 medium variant, versus levels of contraceptive prevalence implied by those fertility projections, using the proximate determinants framework, and from model-based projections of contraceptive prevalence, in 2020, 2025, 2030 and 2035



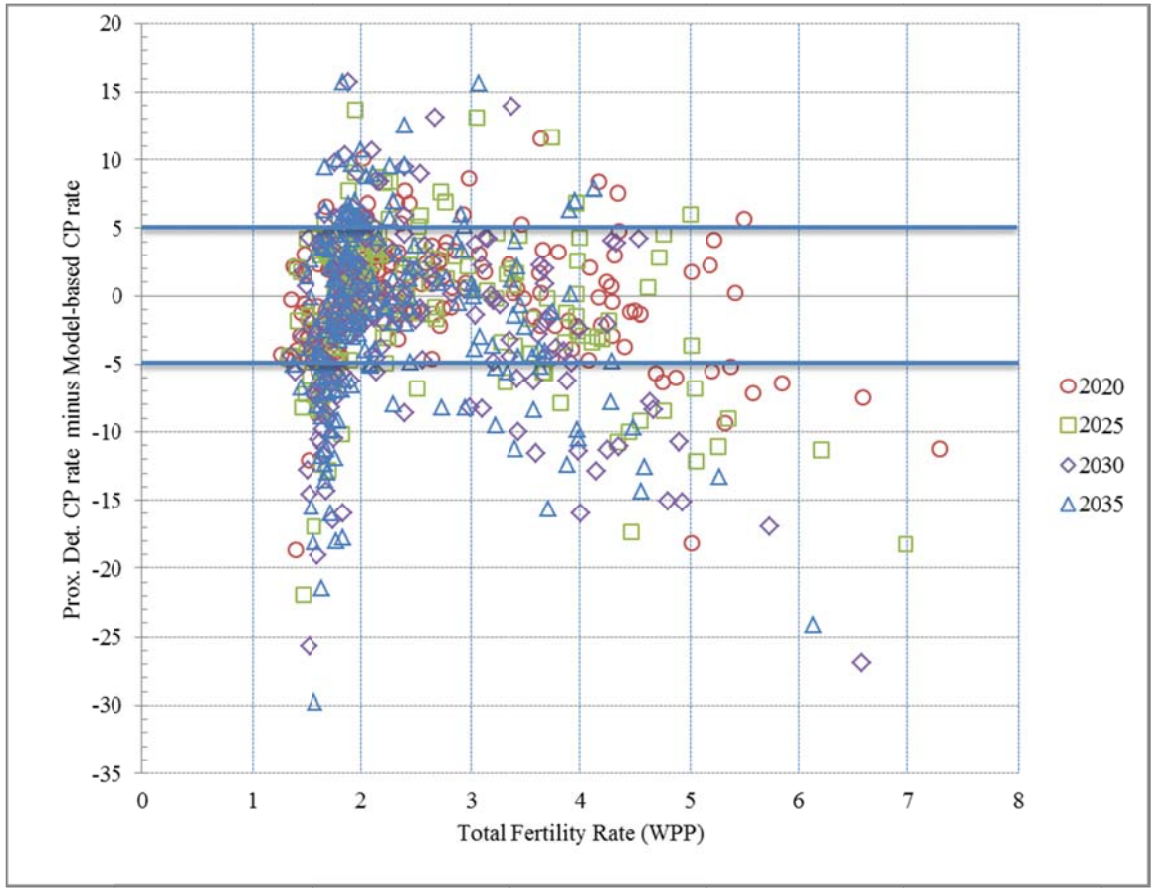
Source: (United Nations, 2013a, 2014b)

Figure 7. Distribution of countries, within regions, according to the difference between the contraceptive prevalence implied by projected total fertility rates from the WPP 2012 medium variant and the model-based projections of contraceptive prevalence



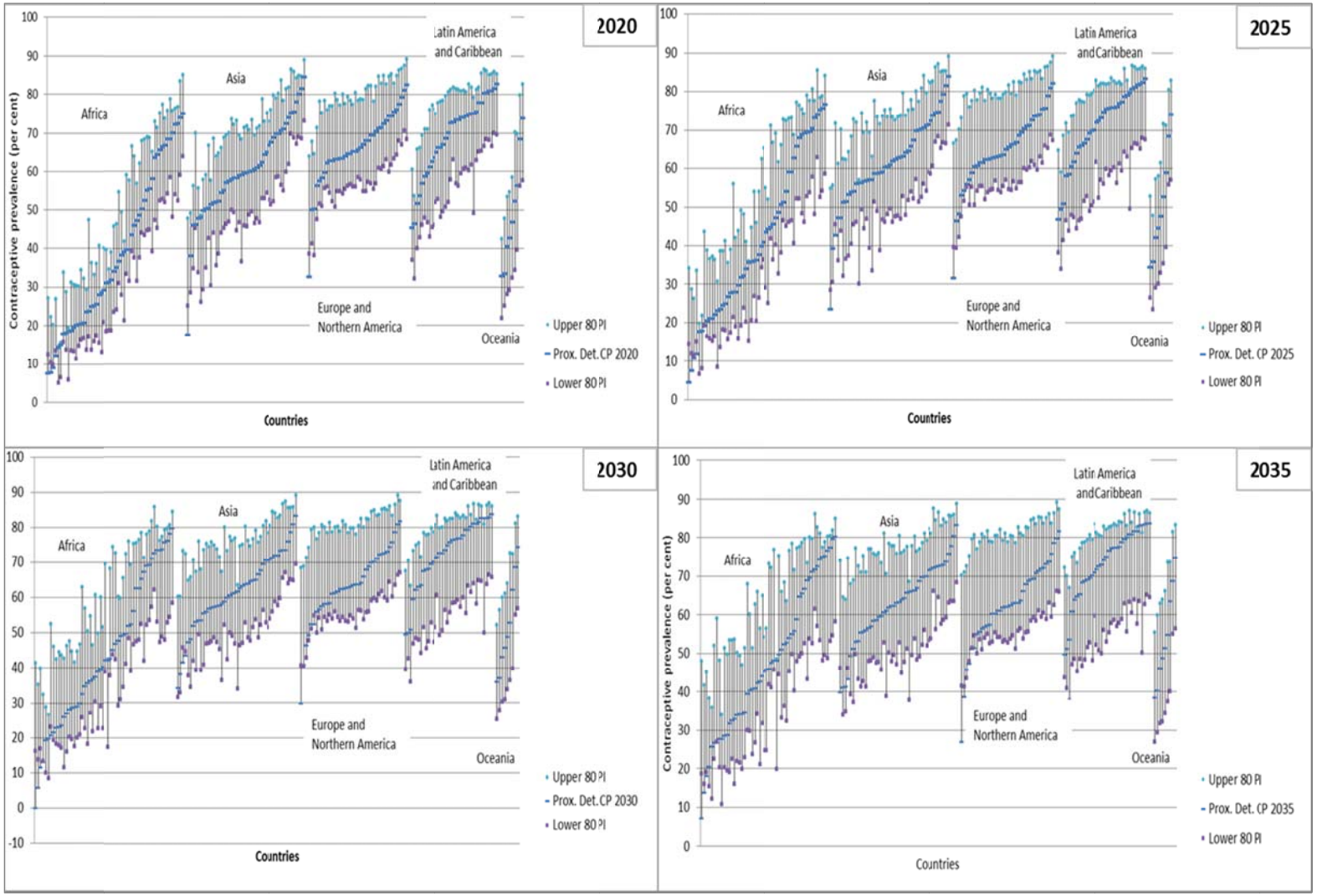
Source: (United Nations, 2013a, 2014b)

Figure 8. Difference between the contraceptive prevalence implied by total fertility rates from the WPP 2012 medium variant and the model-based projections of contraceptive prevalence, in relation to the WPP 2012 medium-variant fertility, by country in 2020, 2025, 2030 and 2035



Source: (United Nations, 2013a, 2014b)

Figure 9. Country-specific contraceptive prevalence implied by projected total fertility rates from the WPP 2012 medium-variant fertility, using the proximate determinants framework, and 80 per cent prediction intervals of the model-based projections of contraceptive prevalence, by region in 2020, 2025, 2030 and 2035



Source: (United Nations, 2013a, 2014b)

REFERENCES

Alkema, Leontine et al. (2011). Probabilistic projections of the total fertility rate for all countries. *Demography*, vol. 48, No. 3, pp. 815–839.

Alkema, Leontine, Vladimira Kantorova, Clare Menozzi and Ann Biddlecom (2013). National, regional, and global rates and trends in contraceptive prevalence and unmet need for family planning between 1990 and 2015: a systematic and. *The Lancet*, vol. 381, No. 9878, pp. 1642–1652.

Biddlecom, Ann and Vladimira Kantorova (2013). Global trends in contraceptive method mix and implications for meeting the demand for family planning. Paper presented at the XXVII IUSSP International Population Conference (Busan, Republic of Korea), 26-31 August 2013. Available at http://iussp.org/sites/default/files/event_call_for_papers/Biddlecom&Kantorova_Global-trends-method-mix_19August2013.pdf (accessed 28 March 2014).

Bongaarts, John (1978). A framework for analyzing the proximate determinants of fertility. *Population and Development Review*, (New York), vol. 4, No. 1, pp. 105–132.

Bongaarts, John (1984). A simple Method for Estimating the Contraceptive Prevalence Required to Reach a Fertility Target. *Studies in Family Planning*, vol. 15, No. 4, pp. 184–190.

Bongaarts, John, Odile Frank and Ron Lesthaeghe (1984). The proximate determinants of fertility in sub-Saharan Africa. *Population and Development Review*, vol. 10, No. 3, pp. 511–537.

Bongaarts, John and Robert G. Potter (1983). *Fertility, Biology, and Behavior: An Analysis of the Proximate Determinants.* New York: Academic Press.

Bongaarts, John and John Stover (1986). Target-setting Model: A Users Manual. (Center for Policy Studies Working Paper No. 130). New York: The Population Council.

Guengant, Jean-Pierre and John F. May (2011). *Proximate Determinants of Fertility in Sub-Saharan Africa and Their Possible Use in Fertility Projections*. Expert Paper No. 2011/13. New York: United Nations.

Johnson, Kiersten, Noureddine Abderrahim and Shea O. Rutstein (2011). *Changes in the Direct and Indirect Determinants of Fertility in Sub-Saharan Africa*. DHS Analytical Studies No. 23. Calverton, Maryland, USA: ICF Macro.

Jolly, Carole L. and James N. Gribble (1993). The proximate determinants of fertility. *Demographic Change in Sub-Saharan Africa*. Washington, D.C.: National Academy Press, pp.68–116.

Moreland, Scott and Ellen Smith (2012). World Population Prospects and Unmet Need for Family Planning. Washington, D.C.: Futures Group.

Potter, Robert G. (1972). Additional births averted when abortion is added to contraception. *Studies in Family Planning*, vol. 3, No. 4, pp. 53–59.

Priskorn, L., and others (2012). Increasing trends in childlessness in recent birth cohorts–a registry based study of the total Danish male population born from 1945 to 1980. *International Journal of Andrology*, vol. 35,pp. 449–455.

Sedgh, Gilda, and others (2012). Induced abortion: incidence and trends worldwide from 1995 to 2008. *Lancet*, vol. 379, No. 9816, pp. 625–632.

Stover, J., L. Heaton and J. Ross (2006). FamPlan: A Computer Program for Projecting Family Planning Requirements. *Washington, DC: Futures Group International*.

Stover, John (1998). Revising the proximate determinants of fertility framework: What have we learned in the past 20 years? *Studies in Family Planning*, vol. 29, No. 3, pp. 255–267.

Trussell, James (2011). Contraceptive failure in the United States. *Contraception*, vol. 83, No. 5, pp. 397–404.

United Nations (2011). World Fertility Report 2009 (United Nations publication). New York: United Nations.

United Nations (2013a). World Population Prospects: The 2012 Revision, CD-ROM Edition. New York: United Nations.

United Nations (2013b). Estimates and Projections of the Number of Women Aged 15-49 Who Are Married or in a Union: 2013 Revision. New York: United Nations.

United Nations (2013c). World Fertility Report 2012 (United Nations publication). New York: United Nations.

United Nations (2014a). World Population Prospects: The 2012 Revision, Methodology of the United Nations Population Estimates and Projections. New York: United Nations.

United Nations (2014b). Model-based Estimates and Projections of Family Planning Indicators 2014. New York: United Nations.

te Velde, Egbert R. and Peter L. Pearson (2002). The variability of female reproductive ageing. *Human Reproduction Update*, vol. 8, No. 2, pp. 141–154.

te Velde, Egbert, Dik Habbema, Henri Leridon and Marinus Eijkemans (2012). The effect of postponement of first motherhood on permanent involuntary childlessness and total fertility rate in six European countries since the 1970s. *Human Reproduction*, vol. 27, No. 4, pp. 1179–1183.

ANNEX TABLE 1. TOTAL FERTILITY RATES CALCULATED FROM MODEL-BASED PROJECTIONS OF CONTRACEPTIVE PREVALENCE, USING THE PROXIMATE DETERMINANTS FRAMEWORK, AND THE TOTAL FERTILITY RATES FROM THE WPP 2012 MEDIUM VARIANT

	Total fertility rate							
	2020		*2025*		*2030*		*2035*	
Major area, region, country or area	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*
AFRICA								
Eastern Africa								
Burundi	5.4	5.4	4.7	5.0	4.1	4.6	3.7	4.3
Comoros	4.3	4.3	3.9	4.0	3.6	3.8	3.3	3.6
Djibouti	3.4	3.0	3.1	2.8	2.8	2.6	2.5	2.4
Eritrea	4.2	4.1	3.7	3.7	3.2	3.4	2.9	3.1
Ethiopia	3.5	3.7	2.9	3.3	2.5	3.0	2.2	2.7
Kenya	3.6	3.9	3.2	3.7	3.0	3.4	2.8	3.2
Madagascar	3.7	4.1	3.3	3.8	2.9	3.6	2.7	3.4
Malawi	4.3	4.9	3.7	4.5	3.2	4.3	3.0	4.0
Mauritius	1.5	1.5	1.5	1.5	1.4	1.6	1.4	1.6
Mozambique	4.4	4.7	3.8	4.3	3.2	4.0	2.9	3.7
Réunion	2.2	2.1	2.3	2.0	2.5	1.9	2.5	1.9
Rwanda	3.7	3.9	3.4	3.5	3.2	3.3	3.0	3.0
Somalia	5.4	5.8	4.8	5.4	4.3	4.9	3.9	4.5
South Sudan	4.7	4.3	4.3	4.0	3.7	3.6	3.4	3.4
Uganda	4.8	5.2	4.1	4.8	3.5	4.3	3.2	4.0
United Republic of Tanzania	4.3	4.7	3.7	4.4	3.3	4.2	3.0	3.9
Zambia	4.5	5.3	4.1	5.1	3.6	4.8	3.4	4.6
Zimbabwe	3.3	3.1	3.1	2.8	2.9	2.7	2.8	2.5
Middle Africa								
Angola	5.3	5.2	4.9	4.7	4.5	4.3	4.3	3.9
Cameroon	4.3	4.3	3.9	4.0	3.5	3.7	3.2	3.4
Central African Republic	3.9	3.8	3.6	3.4	3.3	3.1	3.2	2.9
Chad	5.8	5.5	5.3	5.0	4.8	4.5	4.5	4.1
Congo	4.4	4.5	4.1	4.3	3.8	4.0	3.7	3.8
Democratic Republic of the Congo	5.5	5.2	5.0	4.8	4.6	4.3	4.4	4.0
Equatorial Guinea	4.6	4.2	4.3	3.7	4.1	3.4	3.9	3.1
Gabon	3.7	3.6	3.5	3.4	3.3	3.1	3.2	2.9
Sao Tome and Principe	3.9	3.7	3.5	3.4	3.2	3.2	3.0	3.0
Northern Africa								
Algeria	3.0	2.4	2.9	2.3	2.8	2.1	2.7	2.1
Egypt	2.6	2.5	2.4	2.4	2.2	2.3	2.2	2.2
Libya	2.3	2.1	2.2	1.9	2.2	1.8	2.1	1.7
Morocco	2.4	2.5	2.3	2.3	2.2	2.2	2.2	2.1
Sudan	3.9	4.0	3.4	3.7	3.0	3.4	2.8	3.2
Tunisia	2.0	1.9	2.0	1.8	1.9	1.8	1.8	1.8
Southern Africa								
Botswana	2.7	2.4	2.7	2.2	2.8	2.1	2.7	2.0
Lesotho	2.6	2.7	2.5	2.5	2.4	2.4	2.3	2.3
Namibia	2.9	2.7	3.0	2.5	3.2	2.4	3.1	2.3
South Africa	2.2	2.2	2.3	2.1	2.5	2.0	2.4	2.0
Swaziland	3.5	2.9	3.5	2.7	3.4	2.5	3.3	2.4
Western Africa								
Benin	4.5	4.3	4.1	4.0	3.7	3.7	3.5	3.4
Burkina Faso	5.1	5.0	4.6	4.6	4.1	4.2	3.9	3.9
Cabo Verde	2.5	2.1	2.6	2.0	2.6	1.9	2.5	1.8
Côte d'Ivoire	4.2	4.4	3.9	4.1	3.7	3.9	3.4	3.6
Gambia	5.1	5.4	4.7	5.0	4.2	4.7	4.0	4.3
Ghana	3.7	3.5	3.4	3.2	3.2	3.0	3.1	2.9
Guinea	4.6	4.4	4.2	4.0	3.8	3.7	3.6	3.4
Guinea-Bissau	4.4	4.5	4.0	4.2	3.7	3.9	3.5	3.7
Liberia	4.1	4.3	3.8	4.0	3.6	3.7	3.4	3.5
Mali	6.1	6.6	5.5	6.2	4.7	5.7	4.5	5.3
Mauritania	4.3	4.2	4.0	4.0	3.6	3.7	3.4	3.5
Niger	6.5	7.3	5.7	7.0	4.9	6.6	4.6	6.1

Major area, region, country or area	Total fertility rate							
	2020		2025		2030		2035	
	Prox. Det.	WPP	Prox. Det.	WPP	Prox. Det.	WPP	Prox. Det.	WPP
Nigeria	5.2	5.6	4.6	5.3	4.1	4.9	3.9	4.6
Senegal	4.4	4.5	4.0	4.2	3.6	3.9	3.4	3.6
Sierra Leone	4.1	4.2	3.7	3.9	3.3	3.6	3.1	3.3
Togo	4.2	4.2	3.8	3.9	3.5	3.6	3.3	3.4
ASIA								
Eastern Asia								
China	2.0	1.7	2.1	1.7	2.0	1.8	2.1	1.8
China, Hong Kong SAR	1.1	1.3	1.1	1.3	1.2	1.4	1.2	1.4
Dem. People's Republic of Korea	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.9
Japan	1.2	1.5	1.2	1.6	1.2	1.6	1.2	1.6
Mongolia	2.3	2.3	2.0	2.2	1.9	2.1	1.8	2.1
Republic of Korea	1.3	1.4	1.3	1.5	1.3	1.5	1.3	1.6
Central Asia								
Kazakhstan	2.2	2.3	2.1	2.3	2.0	2.2	1.9	2.1
Kyrgyzstan	2.9	2.8	2.6	2.7	2.3	2.6	2.2	2.5
Tajikistan	3.5	3.5	3.1	3.3	2.7	3.1	2.5	2.9
Turkmenistan	2.3	2.2	2.1	2.1	2.0	2.0	2.0	1.9
Uzbekistan	2.4	2.1	2.3	2.0	2.1	1.9	2.1	1.9
Southern Asia								
Afghanistan	4.4	3.6	3.9	3.1	3.5	2.7	3.2	2.4
Bangladesh	1.9	2.0	1.8	1.9	1.7	1.8	1.6	1.7
Bhutan	1.9	2.0	1.8	1.9	1.7	1.8	1.7	1.7
India	2.2	2.3	2.0	2.2	1.9	2.1	1.8	2.0
Iran (Islamic Republic of)	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8
Maldives	2.1	2.0	1.9	1.8	1.7	1.7	1.6	1.7
Nepal	2.1	2.0	1.9	1.9	1.7	1.8	1.6	1.8
Pakistan	2.9	2.8	2.6	2.5	2.4	2.4	2.2	2.2
Sri Lanka	2.2	2.2	2.1	2.1	2.0	2.0	2.0	2.0
South-Eastern Asia								
Cambodia	2.4	2.6	2.1	2.5	1.9	2.4	1.9	2.3
Indonesia	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9
Lao People's Democratic Republic	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1
Malaysia	1.9	1.9	1.9	1.8	1.8	1.8	1.8	1.8
Myanmar	1.6	1.8	1.5	1.8	1.5	1.7	1.4	1.7
Philippines	2.8	2.8	2.6	2.7	2.5	2.5	2.4	2.4
Singapore	1.2	1.3	1.2	1.3	1.2	1.4	1.2	1.4
Thailand	1.5	1.4	1.6	1.4	1.6	1.5	1.6	1.5
Timor-Leste	3.9	5.0	3.5	4.5	3.3	4.0	3.1	3.6
Viet Nam	2.0	1.6	2.0	1.6	1.9	1.6	2.0	1.6
Western Asia								
Armenia	1.6	1.7	1.5	1.8	1.4	1.8	1.4	1.8
Azerbaijan	1.8	1.8	1.7	1.8	1.6	1.8	1.5	1.8
Bahrain	2.0	1.9	1.9	1.8	1.9	1.8	1.8	1.7
Georgia	1.7	1.8	1.5	1.8	1.4	1.8	1.3	1.8
Iraq	3.5	3.6	3.2	3.4	2.9	3.2	2.8	3.0
Israel	2.7	2.7	2.5	2.6	2.5	2.5	2.4	2.5
Jordan	3.1	2.9	2.9	2.7	2.6	2.5	2.5	2.3
Kuwait	2.4	2.5	2.3	2.4	2.2	2.3	2.2	2.3
Lebanon	1.6	1.5	1.7	1.5	1.7	1.5	1.7	1.5
Oman	2.7	2.4	2.5	2.2	2.2	2.0	2.1	1.9
Qatar	1.9	1.9	1.8	1.8	1.6	1.7	1.5	1.7
Saudi Arabia	2.6	2.3	2.3	2.2	2.0	2.0	1.9	1.9
State of Palestine	3.6	3.6	3.5	3.3	3.3	3.1	3.2	2.9
Syrian Arab Republic	2.7	2.6	2.6	2.5	2.5	2.3	2.4	2.2
Turkey	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.8
United Arab Emirates	1.9	1.7	1.7	1.6	1.5	1.6	1.5	1.6
Yemen	3.5	3.3	3.1	3.0	2.8	2.7	2.6	2.5
EUROPE								
Eastern Europe								
Belarus	1.5	1.6	1.4	1.6	1.4	1.7	1.4	1.7

Major area, region, country or area	Total fertility rate							
	2020		2025		2030		2035	
	Prox. Det.	WPP	Prox. Det.	WPP	Prox. Det.	WPP	Prox. Det.	WPP
Bulgaria	1.4	1.6	1.3	1.7	1.2	1.7	1.2	1.8
Czech Republic	1.6	1.7	1.6	1.7	1.6	1.8	1.7	1.8
Hungary	1.4	1.5	1.4	1.6	1.4	1.6	1.4	1.6
Poland	1.4	1.5	1.4	1.6	1.4	1.6	1.3	1.6
Republic of Moldova	1.5	1.5	1.5	1.5	1.4	1.6	1.3	1.6
Romania	1.4	1.5	1.3	1.6	1.3	1.6	1.3	1.6
Russian Federation	1.5	1.6	1.4	1.7	1.4	1.7	1.4	1.8
Slovakia	1.4	1.5	1.4	1.5	1.3	1.6	1.3	1.6
Ukraine	1.4	1.5	1.3	1.6	1.3	1.6	1.3	1.7
Northern Europe								
Denmark	1.8	1.9	1.8	1.9	1.8	1.9	1.8	1.9
Estonia	1.6	1.7	1.6	1.7	1.7	1.8	1.7	1.8
Finland	1.9	1.9	1.9	1.9	1.8	1.9	1.8	1.9
Ireland	1.9	2.0	1.9	2.0	1.9	2.0	1.8	2.0
Latvia	1.5	1.7	1.5	1.8	1.5	1.8	1.5	1.8
Lithuania	1.4	1.6	1.4	1.7	1.4	1.7	1.4	1.7
Norway	2.0	1.9	2.1	1.9	2.1	1.9	2.1	1.9
Sweden	1.9	1.9	1.9	2.0	1.9	2.0	1.9	2.0
United Kingdom	1.9	1.9	2.0	1.9	2.1	1.9	2.2	1.9
Southern Europe								
Albania	1.6	1.8	1.6	1.8	1.6	1.7	1.5	1.7
Bosnia and Herzegovina	1.1	1.4	1.1	1.5	1.0	1.5	1.0	1.6
Croatia	1.4	1.6	1.4	1.6	1.3	1.7	1.3	1.7
Greece	1.4	1.6	1.4	1.6	1.3	1.7	1.3	1.7
Italy	1.3	1.6	1.3	1.6	1.3	1.7	1.2	1.7
Malta	1.5	1.4	1.5	1.4	1.5	1.5	1.5	1.5
Montenegro	1.5	1.6	1.4	1.6	1.3	1.7	1.3	1.7
Portugal	1.3	1.3	1.3	1.4	1.3	1.5	1.3	1.5
Serbia	1.3	1.4	1.3	1.5	1.2	1.5	1.2	1.5
Slovenia	1.5	1.6	1.4	1.6	1.4	1.7	1.4	1.7
Spain	1.5	1.6	1.4	1.7	1.4	1.7	1.4	1.7
TFYR Macedonia	1.4	1.4	1.3	1.5	1.2	1.5	1.2	1.6
Western Europe								
Austria	1.4	1.6	1.4	1.6	1.5	1.6	1.5	1.7
Belgium	1.7	1.9	1.6	1.9	1.6	1.9	1.6	1.9
France	1.9	2.0	1.9	2.0	1.9	2.0	1.9	2.0
Germany	1.3	1.5	1.3	1.5	1.3	1.6	1.3	1.6
Netherlands	1.6	1.8	1.6	1.8	1.6	1.8	1.6	1.8
Switzerland	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.7
LATIN AMERICA AND THE CARIBBEAN								
Caribbean								
Antigua and Barbuda	2.1	2.0	2.2	2.0	2.3	1.9	2.3	1.9
Bahamas	2.0	1.9	2.1	1.8	2.3	1.8	2.2	1.8
Barbados	2.0	1.9	2.1	1.9	2.3	1.9	2.2	1.9
Cuba	1.4	1.5	1.4	1.5	1.4	1.5	1.4	1.6
Dominican Republic	2.5	2.3	2.5	2.2	2.5	2.1	2.5	2.0
Grenada	2.7	2.0	2.9	1.9	3.1	1.9	3.0	1.8
Guadeloupe	2.0	2.0	2.1	2.0	2.2	1.9	2.2	1.9
Haiti	3.0	2.8	2.7	2.6	2.5	2.4	2.4	2.3
Jamaica	2.3	2.1	2.4	2.0	2.7	2.0	2.7	1.9
Martinique	1.8	1.8	1.9	1.8	2.1	1.8	2.1	1.8
Puerto Rico	1.8	1.6	1.9	1.6	1.9	1.6	1.9	1.7
Saint Lucia	1.8	1.8	1.9	1.7	1.9	1.7	1.9	1.7
Saint Vincent and the Grenadines	2.0	1.9	2.0	1.8	1.9	1.7	1.9	1.7
Trinidad and Tobago	1.7	1.8	1.6	1.8	1.6	1.8	1.5	1.8
United States Virgin Islands	2.6	2.3	2.7	2.3	2.9	2.2	2.9	2.1
Central America								
Belize	2.4	2.4	2.3	2.3	2.2	2.2	2.1	2.1
Costa Rica	2.2	1.7	2.2	1.7	2.3	1.7	2.4	1.7

ANNEX TABLE 1. (*continued*)

	Total fertility rate							
	2020		*2025*		*2030*		*2035*	
Major area, region, country or area	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*	*Prox. Det.*	*WPP*
El Salvador	2.2	2.0	2.3	1.9	2.3	1.9	2.3	1.8
Guatemala	3.4	3.4	3.2	3.1	3.0	2.9	2.9	2.8
Honduras	3.0	2.7	2.9	2.5	2.9	2.4	2.9	2.3
Mexico	2.2	2.0	2.1	1.9	2.1	1.8	2.2	1.8
Nicaragua	2.5	2.3	2.6	2.1	2.6	2.0	2.6	1.9
Panama	2.2	2.3	2.1	2.2	2.0	2.1	2.0	2.1
South America								
Argentina	2.2	2.1	2.2	2.0	2.1	2.0	2.1	2.0
Bolivia (Plurinational State of)	3.0	2.9	2.9	2.8	2.7	2.6	2.7	2.5
Brazil	1.9	1.7	2.0	1.7	2.0	1.7	2.1	1.7
Chile	1.8	1.8	1.8	1.8	1.9	1.8	1.8	1.8
Colombia	2.5	2.1	2.5	2.0	2.6	1.9	2.6	1.9
Ecuador	2.6	2.4	2.5	2.2	2.5	2.1	2.5	2.1
Guyana	2.2	2.3	2.0	2.2	2.0	2.1	1.9	2.1
Paraguay	3.1	2.6	3.1	2.5	3.1	2.4	3.1	2.3
Peru	2.5	2.2	2.5	2.1	2.5	2.0	2.5	1.9
Suriname	2.1	2.1	2.1	2.0	2.2	2.0	2.1	1.9
Uruguay	2.1	2.0	2.1	1.9	2.1	1.9	2.1	1.9
Venezuela (Bolivarian Rep. of)	2.5	2.2	2.5	2.1	2.5	2.0	2.5	2.0
NORTHERN AMERICA								
Canada	1.6	1.7	1.6	1.8	1.7	1.8	1.7	1.8
United States of America	2.1	2.0	2.1	2.0	2.2	2.0	2.2	2.0
OCEANIA								
Australia/New Zealand								
Australia	1.8	1.9	1.8	1.9	1.8	1.9	1.8	1.9
New Zealand	2.1	2.0	2.1	1.9	2.1	1.9	2.1	1.9
Melanesia								
Fiji	2.4	2.4	2.3	2.3	2.1	2.2	2.1	2.1
Papua New Guinea	3.5	3.4	3.2	3.2	3.0	3.0	2.9	2.9
Solomon Islands	3.7	3.6	3.4	3.4	3.2	3.2	3.1	3.0
Vanuatu	3.2	3.1	3.0	3.0	2.8	2.8	2.8	2.7
Micronesia								
Guam	2.3	2.3	2.3	2.2	2.4	2.1	2.3	2.0
Kiribati	2.8	2.7	2.7	2.6	2.4	2.5	2.3	2.4
Polynesia								
Samoa	3.7	3.8	3.3	3.6	3.1	3.4	3.0	3.2

Source: (United Nations, 2013a, 2014b)

ANNEX TABLE 2. CONTRACEPTIVE PREVALENCE RATES IMPLIED BY THE PROJECTED TOTAL FERTILITY RATES FROM THE WPP 2012 MEDIUM VARIANT, USING THE PROXIMATE DETERMINANTS FRAMEWORK, AND THE MODEL-BASED (MEDIAN) PROJECTIONS OF CONTRACEPTIVE PREVALENCE

	Contraceptive prevalence rate							
	2020		*2025*		*2030*		*2035*	
Major area, region, country or area	*Implied by Prox. Det.*	*Model-based*	*Implied by Prox. Det.*	*Model-based*	*Implied by Prox. Det.*	*Model-based*	*Implied by Prox. Det.*	*Model-based*
AFRICA								
Eastern Africa								
Burundi	34.0	33.8	36.0	39.7	37.4	45.2	42.1	49.9
Comoros	29.1	29.5	32.0	34.9	36.2	39.9	40.0	44.5
Djibouti	39.1	30.5	44.3	37.4	47.6	43.9	50.7	49.5
Eritrea	27.9	25.8	31.8	32.0	34.8	38.0	40.6	43.5
Ethiopia	39.7	44.2	45.5	51.8	49.7	57.8	53.8	62.0
Kenya	52.3	56.2	53.9	59.5	55.9	62.0	58.6	63.8
Madagascar	46.0	50.6	47.1	55.0	46.7	58.3	49.6	60.8
Malawi	50.2	56.2	51.1	60.2	51.9	63.2	54.8	65.3
Mauritius	75.0	75.9	74.0	75.9	72.5	75.8	71.6	75.6
Mozambique	17.8	23.5	19.1	29.9	20.4	36.3	26.5	42.1
Réunion	74.1	72.5	76.6	73.0	79.6	73.1	80.0	73.2
Rwanda	55.4	57.2	58.9	60.6	62.6	63.3	65.3	65.4
Somalia	23.6	30.0	27.8	36.8	32.4	43.2	39.1	48.8
South Sudan	18.4	10.8	23.1	16.3	25.8	23.5	32.7	31.5
Uganda	36.7	42.2	39.9	48.4	42.4	53.5	47.4	57.2
United Republic of Tanzania	39.7	46.0	40.9	50.9	42.0	54.9	45.7	58.1
Zambia	43.6	52.9	44.6	56.8	44.8	59.9	47.8	62.2
Zimbabwe	66.7	63.6	68.0	65.1	68.8	66.3	70.9	67.2
Middle Africa								
Angola	24.8	22.6	29.8	27.0	35.7	31.6	42.5	36.2
Cameroon	34.9	34.2	37.6	39.1	39.4	43.9	43.9	48.4
Central African Republic	30.9	27.7	36.1	31.6	39.9	35.7	45.6	39.5
Chad	14.3	8.6	17.6	11.7	19.5	15.3	27.5	19.6
Congo	48.6	50.0	50.4	52.3	52.2	54.6	55.7	56.8
Democratic Republic of the Congo	31.7	27.5	35.8	31.3	38.9	35.0	45.0	38.1
Equatorial Guinea	28.3	19.9	35.5	24.0	42.0	28.2	48.0	32.4
Gabon	38.2	38.0	43.3	41.3	48.8	44.5	52.7	47.5
Sao Tome and Principe	47.1	43.7	48.4	46.8	49.1	49.4	52.2	51.9
Northern Africa								
Algeria	72.3	65.5	75.1	66.7	76.1	67.6	77.2	68.4
Egypt	65.4	64.6	65.7	65.6	65.2	66.6	66.5	67.4
Libya	58.0	52.1	62.7	55.0	67.1	57.3	68.7	59.3
Morocco	68.3	69.4	70.4	70.4	71.0	71.1	72.3	71.6
Sudan	18.7	21.0	20.5	26.1	21.2	31.2	26.4	36.0
Tunisia	68.3	65.6	69.4	66.7	69.2	67.5	69.4	68.3
Southern Africa								
Botswana	64.2	58.9	69.2	60.9	73.3	62.6	74.8	64.0
Lesotho	54.9	57.0	58.9	60.2	62.5	62.5	64.4	64.6
Namibia	63.5	60.8	68.6	62.7	73.6	64.2	75.1	65.5
South Africa	66.4	66.3	69.4	67.0	73.3	67.7	74.2	68.4
Swaziland	72.2	66.1	75.5	67.8	78.0	69.0	79.5	69.9
Western Africa								
Benin	23.5	20.5	26.7	24.2	28.8	27.9	34.0	31.8
Burkina Faso	25.1	23.4	27.6	27.0	28.4	30.5	34.0	33.9
Cabo Verde	69.9	63.1	73.2	64.1	75.6	65.3	76.5	66.4
Côte d'Ivoire	20.4	24.1	24.8	28.1	28.0	32.0	32.5	36.4
Gambia	9.0	14.1	10.7	17.6	12.8	21.2	20.2	25.0
Ghana	31.1	25.8	33.9	29.3	36.8	32.9	40.4	36.3
Guinea	15.0	10.2	17.7	13.5	19.2	17.2	25.5	21.5
Guinea-Bissau	19.4	20.5	21.1	24.2	23.3	28.2	28.5	32.5
Liberia	20.7	23.6	24.5	27.0	28.9	30.8	33.8	34.5
Mali	7.8	15.3	7.5	18.8	5.6	22.6	13.5	26.7

ANNEX TABLE 2. (*continued*)

Major area, region, country or area	Contraceptive prevalence rate							
	2020		2025		2030		2035	
	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based
Mauritania	20.0	19.0	23.5	23.4	26.8	28.4	31.5	33.7
Niger	7.6	18.8	4.4	22.7	-0.2	26.7	6.9	31.0
Nigeria	12.1	19.3	11.7	22.8	11.3	26.5	17.8	30.4
Senegal	20.2	21.4	22.1	25.0	22.6	28.8	27.4	32.6
Sierra Leone	18.1	20.2	21.0	24.4	22.8	29.1	28.3	33.8
Togo	25.5	25.6	27.9	29.2	29.9	32.7	34.4	35.8
ASIA								
Eastern Asia								
China	84.4	82.5	83.9	81.8	83.1	81.1	83.0	80.5
China, Hong Kong SAR	75.2	79.5	74.6	79.2	73.4	79.0	72.1	78.8
Dem. People's Republic of Korea	69.8	69.8	69.7	69.7	69.4	69.9	69.7	69.9
Japan	46.1	58.1	42.5	59.5	41.3	60.3	39.5	61.0
Mongolia	59.8	60.4	58.7	61.7	57.1	62.7	58.2	63.3
Republic of Korea	75.4	78.3	74.4	78.1	73.3	77.6	72.4	77.3
Central Asia								
Kazakhstan	56.9	58.3	56.8	59.9	57.4	61.2	58.4	62.3
Kyrgyzstan	45.9	45.3	47.1	48.8	47.0	51.7	49.2	54.1
Tajikistan	38.1	38.3	39.1	42.5	38.0	46.3	41.0	49.2
Turkmenistan	61.6	59.7	62.8	61.2	63.1	62.4	64.1	63.1
Uzbekistan	70.9	67.6	71.1	68.1	70.7	68.5	71.5	68.8
Southern Asia								
Afghanistan	47.9	36.4	56.2	43.0	61.6	48.5	65.7	53.2
Bangladesh	64.8	65.4	65.6	66.7	64.9	67.6	66.1	68.2
Bhutan	69.8	70.5	71.3	72.0	71.8	73.0	72.8	73.5
India	60.1	62.2	60.7	63.4	60.5	64.8	61.8	65.7
Iran (Islamic Republic of)	78.1	76.7	77.3	76.6	75.8	76.2	75.7	75.9
Maldives	50.2	47.1	53.2	51.0	53.4	54.0	55.2	56.6
Nepal	58.9	58.4	60.5	61.4	61.0	63.4	62.2	65.0
Pakistan	47.6	44.2	51.2	49.3	53.0	53.3	55.9	56.6
Sri Lanka	72.4	71.8	72.3	71.9	71.9	72.0	72.6	72.1
South-Eastern Asia								
Cambodia	57.9	62.5	58.6	65.4	58.6	67.2	60.5	68.5
Indonesia	64.3	63.7	64.5	64.5	64.6	64.8	65.6	65.1
Lao People's Democratic Republic	60.6	58.1	62.7	61.1	63.8	63.3	66.0	64.6
Malaysia	59.7	59.3	61.7	60.6	62.4	61.6	62.9	62.3
Myanmar	51.7	56.6	54.0	59.9	55.9	61.9	56.4	63.5
Philippines	54.5	55.4	56.5	57.3	57.5	58.8	59.4	60.2
Singapore	62.2	66.8	63.1	67.5	63.5	67.9	63.1	68.1
Thailand	80.0	77.8	79.3	77.2	78.4	76.7	77.7	76.3
Timor-Leste	17.3	35.5	23.4	40.8	34.1	45.4	40.8	49.1
Viet Nam	81.6	77.6	81.4	77.1	80.6	76.7	80.3	76.3
Western Asia								
Armenia	58.2	61.3	56.2	62.7	53.3	63.8	52.8	64.7
Azerbaijan	59.4	59.2	59.1	61.1	56.9	62.6	56.8	63.8
Bahrain	68.7	67.3	70.1	68.1	70.5	68.8	71.4	69.3
Georgia	50.4	54.8	47.1	57.3	43.4	59.3	43.1	60.8
Iraq	55.1	57.3	56.0	59.6	56.7	61.5	59.1	63.0
Israel	70.6	71.6	70.5	71.8	71.0	72.0	72.1	72.3
Jordan	66.7	63.4	67.4	64.6	67.5	65.6	69.5	66.4
Kuwait	58.3	59.5	60.1	61.3	61.1	62.8	62.0	64.0
Lebanon	67.6	64.5	69.8	65.6	70.5	66.3	69.7	67.1
Oman	51.3	43.6	57.0	48.3	58.0	52.3	60.9	55.2
Qatar	52.2	51.8	53.7	54.8	51.8	56.9	52.9	58.9
Saudi Arabia	49.8	42.9	51.2	46.7	48.1	50.1	51.0	52.9
State of Palestine	57.4	58.9	62.3	60.7	64.5	62.2	66.7	63.3
Syrian Arab Republic	60.9	60.0	64.0	61.8	66.4	63.1	68.5	64.1
Turkey	74.0	73.1	73.8	73.1	73.1	73.1	73.5	73.1
United Arab Emirates	59.0	52.5	58.7	55.4	55.3	57.9	55.4	59.7
Yemen	52.0	49.7	56.9	54.8	59.9	58.7	63.8	61.7

ANNEX TABLE 2. (*continued*)

Major area, region, country or area	Contraceptive prevalence rate							
	2020		2025		2030		2035	
	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based
EUROPE								
Eastern Europe								
Belarus	65.1	67.4	62.7	67.4	61.0	67.4	60.0	67.1
Bulgaria	59.7	68.0	55.8	68.5	52.3	68.7	51.1	69.1
Czech Republic	77.4	78.5	75.6	77.6	74.2	76.8	73.6	76.2
Hungary	71.3	74.2	70.2	73.9	69.8	73.5	68.9	73.3
Poland	67.9	69.6	65.5	69.8	62.2	69.7	60.9	69.8
Republic of Moldova	69.3	67.8	66.6	68.0	63.4	68.2	62.3	68.4
Romania	64.5	69.0	61.4	68.7	58.0	68.6	56.7	68.4
Russian Federation	65.5	69.1	62.9	69.1	61.1	69.3	60.1	69.2
Slovakia	68.0	71.2	66.2	71.1	64.0	71.1	62.8	70.9
Ukraine	62.1	66.8	58.9	67.3	56.6	67.3	55.4	67.7
Northern Europe								
Denmark	69.3	71.0	68.5	70.8	67.9	70.8	67.7	70.7
Estonia	62.7	65.3	62.2	65.7	63.5	66.0	62.8	66.1
Finland	74.4	74.2	73.9	74.1	73.0	74.0	72.9	73.8
Ireland	66.9	67.7	66.1	68.0	65.8	68.2	65.9	68.6
Latvia	63.4	68.5	62.2	68.5	62.6	68.6	61.8	68.7
Lithuania	58.3	63.9	56.9	64.3	55.8	64.5	54.8	64.6
Norway	79.4	78.1	78.9	77.4	78.4	76.7	78.4	76.3
Sweden	70.4	70.8	69.4	70.8	68.8	70.7	68.6	70.7
United Kingdom	81.1	80.4	80.9	79.7	81.5	79.1	81.5	78.6
Southern Europe								
Albania	62.6	66.7	63.2	67.0	62.2	67.3	61.7	67.4
Bosnia and Herzegovina	32.6	51.2	31.5	53.4	29.6	55.3	26.7	56.5
Croatia	63.1	66.8	60.4	67.1	57.4	67.3	56.3	67.5
Greece	65.1	69.7	61.5	69.8	58.2	69.9	57.1	70.0
Italy	57.5	66.1	54.1	66.4	52.2	66.6	50.9	66.9
Malta	82.5	80.6	82.0	80.2	80.7	80.1	79.7	79.8
Montenegro	50.0	54.9	48.1	56.6	46.2	57.9	45.5	59.0
Portugal	75.9	76.3	73.9	75.7	72.3	75.3	71.1	74.9
Serbia	56.2	60.2	52.9	61.1	49.1	61.9	47.0	62.5
Slovenia	72.4	74.9	71.1	74.6	70.0	74.4	69.2	74.2
Spain	63.3	66.8	60.6	67.0	58.1	67.1	57.1	67.0
TFYR Macedonia	50.2	51.5	46.3	53.6	40.6	55.2	38.5	56.6
Western Europe								
Austria	64.0	67.5	63.1	67.3	62.8	67.1	61.9	67.0
Belgium	66.2	69.1	64.8	69.5	63.7	69.9	63.5	70.1
France	73.2	74.0	72.5	73.9	72.1	73.8	72.1	73.7
Germany	63.1	67.6	62.3	68.3	61.5	68.8	60.8	68.8
Netherlands	64.6	68.3	63.6	68.4	63.0	68.7	62.7	68.9
Switzerland	74.5	75.3	73.6	74.8	72.4	74.4	71.9	74.4
LATIN AMERICA AND THE CARIBBEAN								
Caribbean								
Antigua and Barbuda	66.1	64.3	69.1	65.1	72.4	65.9	72.8	66.6
Bahamas	70.0	67.7	72.4	68.4	74.6	68.7	74.7	69.0
Barbados	67.0	65.3	69.6	66.1	72.6	66.6	72.4	67.1
Cuba	72.9	73.5	72.0	73.5	71.3	73.4	70.7	73.2
Dominican Republic	74.4	72.0	75.3	72.0	76.2	72.0	77.1	72.0
Grenada	75.1	65.0	79.6	65.9	82.4	66.7	83.0	67.3
Guadeloupe	61.0	60.4	63.9	61.7	67.9	62.9	68.1	63.9
Haiti	46.3	42.3	49.3	46.3	50.7	49.5	53.5	52.3
Jamaica	74.0	71.8	77.3	71.8	80.9	71.9	81.5	71.8
Martinique	62.5	62.2	65.5	63.5	70.1	64.3	70.0	65.1
Puerto Rico	80.2	77.9	80.6	77.5	80.8	77.3	80.6	77.1
Saint Lucia	63.5	62.0	65.9	63.0	68.1	63.9	68.5	64.8
Saint Vincent and the Grenadines	68.6	66.4	69.9	66.9	71.0	67.5	71.5	68.1
Trinidad and Tobago	51.5	53.3	50.7	55.5	49.8	57.2	49.6	58.8

ANNEX TABLE 2. (*continued*)

Major area, region, country or area	Contraceptive prevalence rate							
	2020		2025		2030		2035	
	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based	Implied by Prox. Det.	Model-based
United States Virgin Islands	73.4	70.2	76.1	70.4	79.1	70.7	79.8	70.9
Central America								
Belize	58.5	59.9	60.5	61.3	62.1	62.6	63.7	63.4
Costa Rica	82.7	78.4	83.3	78.0	83.6	77.6	83.6	77.2
El Salvador	74.0	71.3	75.6	71.6	76.7	71.7	77.3	71.7
Guatemala	59.4	59.2	61.5	61.2	63.0	62.6	65.2	63.9
Honduras	75.5	73.0	76.7	73.0	77.5	73.0	78.6	72.9
Mexico	75.0	72.8	75.9	72.9	76.6	72.9	77.2	72.6
Nicaragua	81.4	79.1	82.2	78.7	82.8	78.3	83.4	77.9
Panama	56.8	58.1	58.1	59.7	59.3	60.9	60.7	61.9
South America								
Argentina	72.5	70.8	73.1	70.9	73.3	71.0	73.9	71.0
Bolivia (Plurinational State of)	64.9	64.0	66.5	65.2	67.4	66.0	68.9	66.8
Brazil	80.5	78.4	81.1	78.0	81.4	77.4	81.4	77.0
Chile	66.0	66.4	67.5	67.0	69.3	67.4	69.3	68.0
Colombia	80.8	77.8	81.7	77.3	82.4	76.9	82.9	76.7
Ecuador	74.9	72.7	75.7	72.7	76.5	72.7	77.4	72.7
Guyana	45.3	48.5	46.7	51.7	49.5	54.0	51.0	55.9
Paraguay	80.9	77.2	81.9	76.8	82.5	76.5	83.3	76.3
Peru	77.9	74.2	79.0	74.1	79.9	73.9	80.6	73.6
Suriname	53.5	54.8	58.3	56.9	63.5	58.7	64.4	59.9
Uruguay	77.9	76.8	78.5	76.7	79.1	76.6	79.4	76.4
Venezuela (Bolivarian Republic of)	73.3	70.4	74.5	70.5	75.7	70.6	76.4	70.6
NORTHERN AMERICA								
Canada	71.3	73.1	70.9	73.0	71.0	72.8	70.7	72.6
United States of America	75.4	74.3	75.4	73.9	75.7	73.5	75.7	73.2
OCEANIA								
Australia/New Zealand								
Australia	68.3	69.4	68.2	69.5	68.4	69.8	68.5	70.0
New Zealand	73.8	71.3	74.0	71.5	74.2	71.4	74.5	71.3
Melanesia								
Fiji	52.2	51.8	52.6	53.3	52.8	54.7	54.5	55.5
Papua New Guinea	40.3	39.8	42.1	42.3	42.9	44.4	45.9	46.4
Solomon Islands	42.7	41.1	44.4	43.6	45.6	45.6	48.6	47.7
Vanuatu	46.6	44.9	47.4	46.8	48.8	48.6	51.1	50.2
Micronesia								
Guam	56.1	55.0	58.8	55.8	62.0	56.8	63.2	57.7
Kiribati	32.9	31.4	35.7	34.7	35.8	37.5	38.3	40.3
Polynesia								
Samoa	33.4	35.5	34.3	38.5	37.0	41.4	40.1	43.7

Source: (United Nations, 2013a, 2014b)